American Machinist

DECEMBER 18, 1947

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Die Casting—
a special report

Machining by
Electric Erosion

Aluminum Replaces
Steel in Fords

Completely New

HEALD Multi-Way BORE-MATICS

Simultaneously "borize" two or more angularly spaced holes

YOU CAN BORE in two or three directions at the same time. Bore in each direction with one, two or three boringheads, at different rates of "in" and "out" feeds. Besides boring, you can face, turn, chamfer, groove and fly cut, alone or in any combination of these operations. And do *all this* automatically, at the same setting.

Here is modern machining at its most spectacular — in the all-new Heald Multi-Way Bore-Matics, ready to do just about anything in the way of highest-production, highest-precision finishing.

These machines are extremely versatile in application, the center section having workholding fixtures readily adaptable to large cumbersome parts or awkwardly shaped work. Into them has been incorporated a vast fund of Heald engineering research and experience, including such outstanding Heald features as:

SINGLE HYDRAULIC POWER UNIT—furnishes hydraulic power to entire machine . . . assuring smooth, even performance.

TWO-PUMP SYSTEM—single relief valve control circulates only minimum amount of oil . . . isolated from base to reduce heat and vibration, provide easier maintenance.

UNIFORM HYDRAULIC FEEDS—remain constant throughout the day without adjustment . . . maintain definite production, finish and accuracy.

Nearest Heald branch office can give you complete details.

• **WRITE FOR BULLETIN** on these new Heald Multi-Way Bore-Matics. Lists specifications for Models 233-333-232-332.

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

TECHNOLOGY DEPARTMENT

PUBLIC LIBRARY
DEC 19 1947
DETROIT

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

BURNHAM FINNEY ..... Editor
E. J. TANGERMAN ..... Managing Editor

Associate Editors: RUPERT LE GRAND, HARRY S. WHAREN, BEN C. BROSHEER (Chicago), ANDERSON ASHBURN, H. E. LINSLEY, JAMES VAN VOAST, CHESTER S. RICKER (Detroit), J. J. McGUINNESS (News)

Assistant Editors: ELEANOR W. MERRILL (Statistics), ROBERT GRAHAM.

SYDNEY OXBERRY ..... Art Director
RICHARD ROOMAN ..... Assistant

DEXTER KEEZER .. Director, Economics Dept.

JOHN CHAPMAN .... World News Director

GEORGE E. DOYING, JR. ..... Washington

FRED H. COLVIN ..... Editor Emeritus

ALBERT HAUPTLI, JR. ..... Publisher
WILLIAM E. KENNEDY ..... Asst. Publisher

District Managers: JOHN H. KOCH, PHILIP G. WEATHERBY, Statler Building, Boston, Mass.; JAMES A. McGRAW, HUGH BRITTON, 330 W. 42nd St., New York 18, N. Y.; RICHARD FULLER, Architects Bldg., 17th & Sansom Sts., Philadelphia 3, Pa.; RAY DEEN, ANSON E. MEANOR, 520 N. Michigan Ave., Chicago, Ill.; ADOLPH F. TISCHER, Hanna Bldg., Cleveland, O.; ROBERT H. ANDERSON, 1110 Delta Ave., Cincinnati, O.; DAVID G. JONES, Penobscot Bldg., Detroit, Mich.; JOHN W. OTTERSON, 68 Post St., San Francisco, Calif., ROY PHELAN, 621 So. Hope St., Los Angeles, Calif.; R. C. MAULTSBY, Rhodes-Haverty Bldg., Atlanta, Ga. Other offices: Continental Bldg., St. Louis, Mo.; National Press Bldg., Washington, D. C.; Oliver Bldg., Pittsburgh, Pa.; Aldwych House, Aldwych, London, W.C. 2.

Member of the Associated Business Papers and the Audit Bureau of Circulations.

COPYRIGHT 1947 by McGraw-Hill Publishing Company, Inc. All rights reserved.

Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A. Return postage guaranteed.

CONTENTS for December 18, 1947

VOL. 91, NO. 26

ADMINISTRATION

Editorial ..... *Burnham Finney* 85
A Visit From the General Manager ..... *George Burnley* 92
Step Down or Step Out? ..... *Round Table* 102
Political Action—Labor's Blind Alley ..... *James H. McGraw, Jr.* 118

SPECIAL REPORT

How to Make Die Castings ..... *James Van Voast* 103

ENGINEERING

Shadowgraph a Sample to Find Tool Errors ..... *C. H. Bodner* 87
What to Look for in Hydraulic Oils . . . 4 ..... *Anthony J. Zino, Jr.* 94
Aluminum Replaces Steel in Ford Parts ..... *Chester Ricker* 96
Purchased-Parts Quality Controlled ..... *Ernest L. Fay* 98
Machining By Erosion ..... *E. R. & N. I. Lazarenko* 120
Job-Shop Production Control ..... *Harold W. Newhouse* 122
Clearances for Fine-Pitch Gears ..... *(RBS)* 149
Selection of Stripper Springs ..... *J. R. Paquin* 153

HEAT TREATING AND ASSEMBLY

Automatic Induction Hardening ..... *G. P. Cardwell & M. Server* 91

MATERIAL CUTTING, FORMING

Welding—Island Style ..... *Mac Diogenes* 101
How to Mark Plastics ..... *H. O. Bates* 119
Double-Crank Adjustable Miller Table ..... *Charles Schisler* 129
Acme Thread Cutting ..... *Howard De Heer* 130
Deep Recesses Burred with Hand Tool ..... *Charles Kidwell* 131
Small-Shop Shorts ..... *S. Framurz* 131
Short-stroke Press Draws Cups ..... *Bernard Berman* 133
Screw Device Controls Helical Flute Grinds ..... *A. A. Sinisi* 134

TOOLING

Adjustable Jig Locates Double Centers ..... *H. Moore* 129
Triple Unit Reamer Tap Finishes Large Holes ..... *Charles Kidwell* 130
Spring Wiggle Rod ..... *C. E. Hart* 131
Drill Jig Replaces Vise Jaw ..... *Arthur F. Hird* 132
Sine Bar Feet Eliminate Wear ..... *Leonard T. Quick* 132
Two-Flue Floating Reamer Centers in Bores ..... *Martin H. Ball* 132
Carbide Jaws Reduce Wear ..... *C. W. Hinman* 132
Indexing Dog ..... *M. J. Walsh* 133
Adapter ..... *Harold C. Savage* 133
Lathe Miller Split Chuck ..... *Arthur Silvester* 133
Center Drill Holder Reduces Breakage ..... *Ervin E. Wragg* 134

NEWS OF METALWORKING

Spot News 83
Gaging Business 138
Detroit Report 139
Names in the News 145

DEPARTMENTS

Talking Shop 97
Reference Book Sheets 149
Shop Equipment News 155
Parts and Materials 176
Round Table Discussions 182
New Books 190
Seen and Heard 194
Free Literature Available 222A

PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y.
Cables: "McGRAW-HILL, NewYork"

James H. McGraw, Jr., President; James H. McGraw, Founder and Honorary Chairman; Curtis W. McGraw, Senior Vice-President and Treasurer; Nelson Bond, Director of Advertising; Eugene Duffield, Editorial Assistant to the President; Joseph A. Gerardi, Secretary; J. E. Blackburn, Director of Circulation.

Chips and QUIPS

Our Cover . . . Christmas is just around the corner and our special report on Die Casting comes to you in this issue, so we combined the two ideas in a cover Kodachrome showing the test end of the assembly line at Lionel Corporation, Irvington, N. J. When Sid Karson of McGraw-Hill Studios shot the picture, workers were building toy trains for Christmas at top speed, accompanied by alternating music and World Series ball-game reports on the public-address system. Here, Jean Ippolito is simultaneously testing interior lights and pulling capacity of automatic magnetic knuckle couplers of a Lionel Pullman on a special test track. The conveyor belt in the background carries cars to this final test, then on to inspection and packaging. It was dammed (so were we) at upper left for this picture.

For more details on the intricate die castings that go into a toy train—some of the most intricate made—see the Die Casting report. Associate Editor Van Voast has been at it for several months, including trips to the Midwest and other areas to gather data. Here he has assembled more basic data than he could find printed anywhere, coupled with latest "how to" information.

Product Control . . . A good product means good work all along the line. C. H. Bodner tells, in our lead article, how to trace product errors back to tool or setup. Machined sections on piece and a trial lot are compared with an optical comparator to find tool deficiencies . . . Then Ernest L. Fay applies statistical methods to inspection of incoming parts, thus preventing defectives from reaching assembly lines, cutting production costs and avoiding delays.

For Job Shops . . . Harold W. Newhouse shows how Saranac applied a combined wage-incentive and production-control system to a large volume of small-quantity shop orders, and got a very workable system.

Demulsibility . . . Tony Zino continues his series on petroleum oils for hydraulics, this time discussing the importance of demulsibility, the third factor of importance in selection. Three more will be explained in subsequent articles.

Aluminum for Steel . . . By substituting aluminum for steel in some parts, Ford saves 120 lb. of raw material per car. Not impressive as such—but these changes free enough steel to build 100,000 additional cars.

Christmas, Too . . . In addition to our Christmas cover, we've rushed one story into this issue, called "A Visit from the General Manager," by George Burnley. It's a fable with a real moral —the G.M. visits one of his plants over the Christmas holidays, but as a toolcrib man. He learns a number of things that help men, plant and himself.

Erosion Machining . . . Some months ago, we carried the first report from behind the Soviet iron curtain of their new method of "erosion machining," which sounds very much like our broken-tap disintegrators. Now our Moscow man has gone as far as he dares in digging up and reporting the details.

Coming . . . We start 1948 with an issue dated Jan. 1. As that puts three issues in January we've decided to make the third—Jan. 29—our 35th Annual Review Number. This, incidentally, will be the largest issue ever in new equipment described—1500 items.

For Jan. 1, we bring you the story of the Jeep's shift to civvies. Delmar Roos describes the line of utility vehicles built around it — everything from a fire truck to a bobby-soxer's dream. Our cover ties in, with an "impossible" shot of the line of mighty presses at Willys—quite an impressive sight . . . We start the year with a 2-part special report that will be a tool engineer's delight—32 pages of pictures of vertical surface-broaching fixtures. Also in that issue are some Shop Shots from Studebaker, more Short Cuts, an example of tricky tooling to cut costs on two relay parts, and materials-handling hints around power saws.

TOOL DETECTIVE . . . C. H. Bodner, who authored our lead article "Shadowgraph A Sample to Find Tool Errors," was tool engineer and tool standards engineer at Lockheed from late 1941 until March of this year. There he was in charge of Hi-cycle and negative angle applications with carbide tipped tools, as well as standardization of all cutting tools and gages. He was also engaged in development of optical comparator inspection of involute splines.

After graduation from Chaffey Junior College, Ontario, Calif., in 1934, Mr. Bodner joined Fontana Ice Machine Co., installing and maintaining commercial refrigeration. In 1940-41 he worked in the machine shop at Vultee Aircraft on Hi-cycle miller development and operation. He is now factory representative in the Los Angeles area for Kennametal, Inc.

A UNIT OF GEAR CUTTING MACHINERY WITH A COMPLETELY NEW GENERATOR

FOR CUTTING SMALL

SPIRAL BEVEL,
ZEROL BEVEL,
HYPOID GEARS

The Gleason No. 2 Hypoid Generator . . . faster cutting . . . superior tooth bearing . . . production quantities or small jobs . . . closer control of actual cutting . . . heading a unit of equipment for the smooth production of bevel gears and hypoids for small tools and appliances.

GLEASON No. 2 HYPOID GENERATOR

GLEASON No. 7 HYPOID CUTTER SHARPENER

GLEASON No. 4 ANGULAR BEVEL TESTER

The Gleason No. 4 Angular Bevel Tester . . . employed to check the rolling qualities, tooth spacing and concentricity of the cut gears.

The Gleason No. 7 Hypoid Cutter Sharpener . . used for the sharpening of the multi-blade circular cutters used in the No. 2 Hypoid Generator.

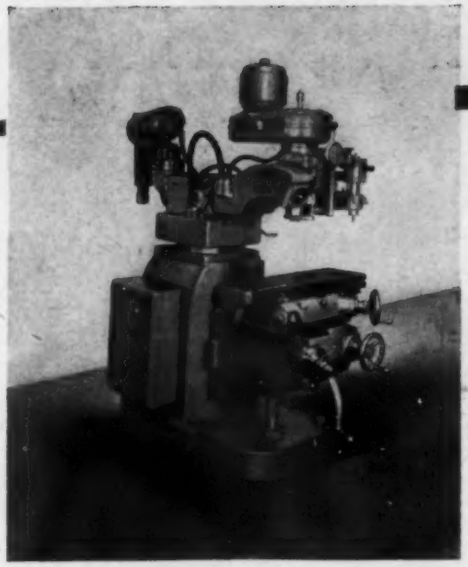
GLEASON Works
1000 University Avenue
Rochester 3, N.Y., U.S.A.

Builders of Bevel Gear Machinery for Over Eighty Years

Left: Drawing of the golf club head forging die being milled on the CINCINNATI 8" x 18" Tool and Die Miller illustrated below.

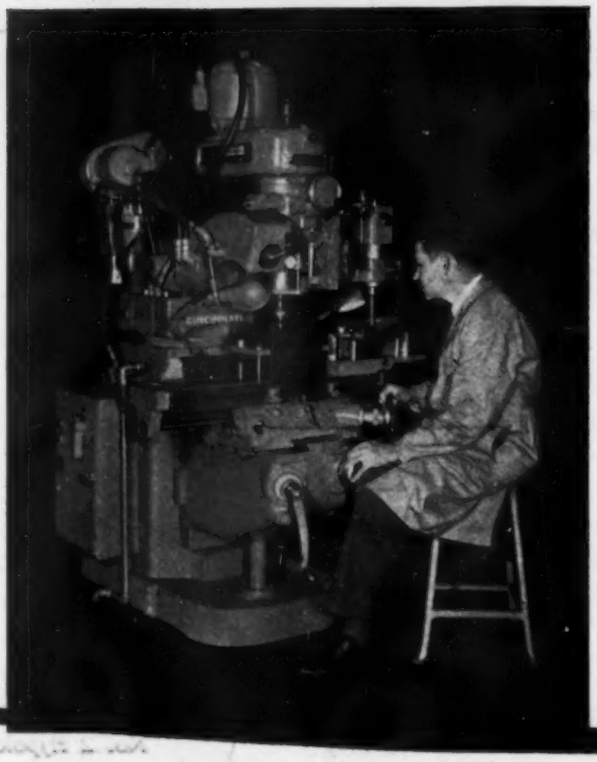
Right: CINCINNATI 8" x 18" Tool and Die Milling Machine. Catalog M-1620 contains complete specifications.

CINCINNATI



IT FOLLOWS THE DIE IMPRESSION AUTOMATICALLY AND EXERTS ONLY A FEW OUNCES PRESSURE

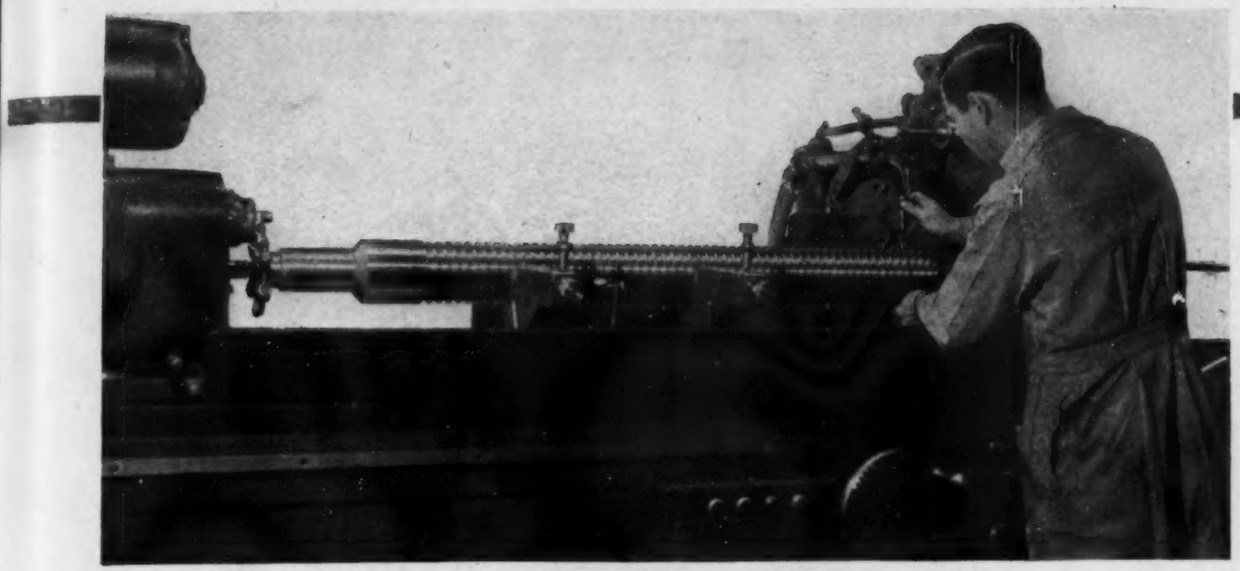
A delicate touch counts a lot in diesinking. Upon it depends the material of which the master is made; and the accuracy and finish of the die impression. The tracer finger of the duplicating unit on the new CINCINNATI 8" x 18" Tool and Die Miller supplies the delicate touch, independent of any human control. It responds to a few ounces pressure, automatically following the ups and downs of the impressions in the master. The operator can concentrate *all* his attention on the job, as he is doing in the illustration at the right while milling a golf club head forging die. With his hands on the table and cross traverse handwheels, he has unusually sensitive feed control, for the feed screws engage *antifriction nuts*. These new CINCINNATI'S offer many other features of value in tool and die milling. You may obtain complete information by writing for catalog M-1620.



THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES



A REAL TEST OF PERFORMANCE...
grinding the teeth of an internal broach

CINCINNATI

Grind first tooth to size. Adjust to next tooth and grind to size. Repeat for each tooth... that's what the operator is doing in the illustration above. It's the second operation in grinding an expensive part, an internal broach. Each tooth is "backed off" separately, accurately sized in respect to the next one. ¶A prominent broach manufacturer assigned this job to his CINCINNATI FILMATIC 14" Hydraulic Universal because he can depend upon sizing. The hand cross feed, with its large micrometer dial incorporated in the handwheel, gives a true reading for size, thereby eliminating much of the conventional "cut and try." These machines have many other features of value in grinding multiple diameter parts, and taper, face and internal work as well:

CINCINNATI FILMATIC 14" Hydraulic Universal Grinder. Catalog G-486-4 covers the 12" machine; catalog G-473-3 the 14", 16" and 18" machines.

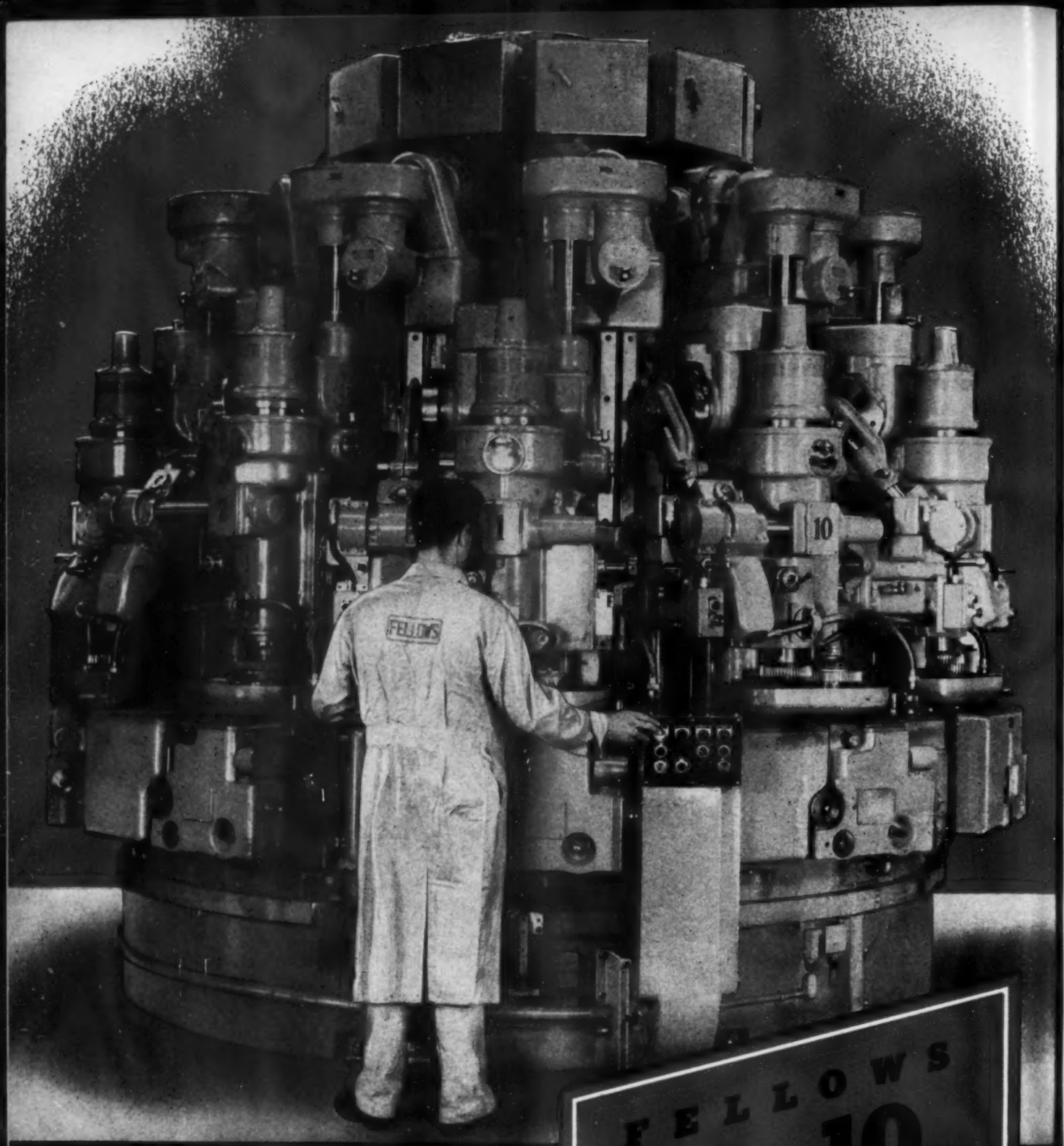
FILMATIC grinding wheel spindle bearings • Infinite headstock spindle speeds, 9 to 1 ratio • Hinged internal grinding head, always ready to use.

Complete data may be obtained by writing for catalog G-474-3.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES



For Production Gear Cutting

FELLOWS
No. 10 ROTARY

ADAPTED TO THE CUTTING OF

Cutting Gear Costs

to New Time Demands

A ten-unit independently controlled Fellows gear shaper, turret-mounted to rotate on a single base . . . 85,000 pounds of massive efficiency . . . an outstanding new design capable of taking heavy cuts at high speed, and using cutters up to 6 inches diameter. Each independent "station" and the entire machine is electrically controlled for automatic, time-cycled and time-saving operation . . . record production rates! Traditional Fellows precision output and versatility. Write for a new bulletin on the No. 10 Rotary Gear Shaper.

The Fellows Gear Shaper Company, Head Office and Export Department, Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2; 640 West Town Office Bldg., Chicago 12; 7706 Empire State Bldg., New York 1.

• *A Fitting Companion to the Planetary Gear Shaper*

Fellows METHOD

EXTERNAL AND INTERNAL SPUR AND HELICAL GEARS

CHRIS

1 9

PEACE, GOODWILL T

COUNTLESS generations have heralded the glad tidings of the Heavenly Host on the first Christmas Day which have been translated into English as "glory to God in the highest, on earth peace, good will toward men."

More recently scholars believe the truer meaning would be "on earth peace, among men of good will."

The history of our times clearly shows there can be no real peace unless there is good will among men, good will toward one another. And there will be that peace only if men

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

STMAS
4 7

L TOWARD MEN ✣ ✣

of good will earnestly devote themselves to make it come true.

How much our world needs this spirit of good will! In daily life, in the nation, throughout the world. Each one of us can do his part, to live and spread this spirit by which peace can be restored on the earth.

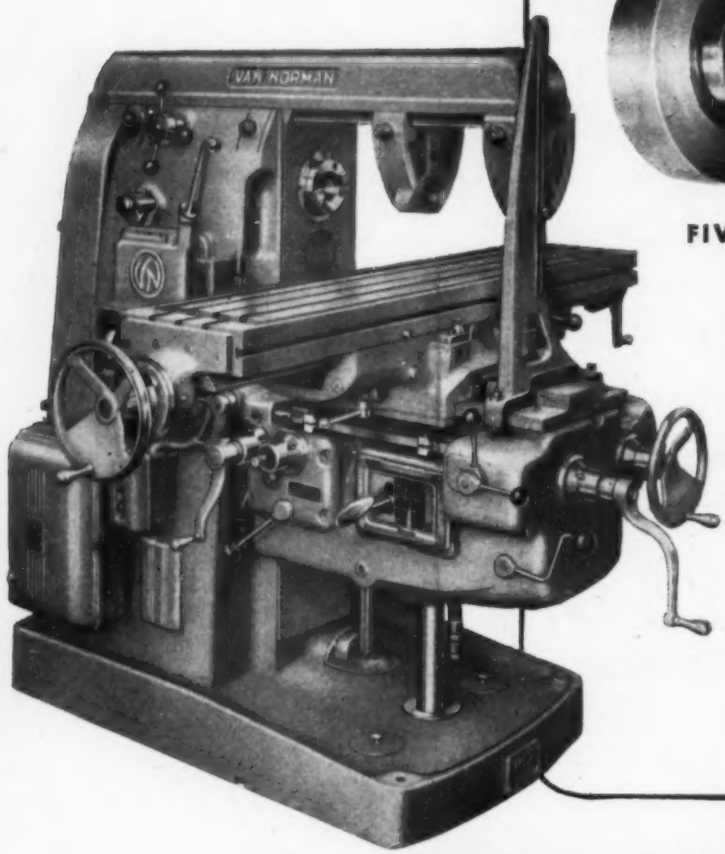
In this time of Christmas joy, let us remember that peace comes from men of good will.

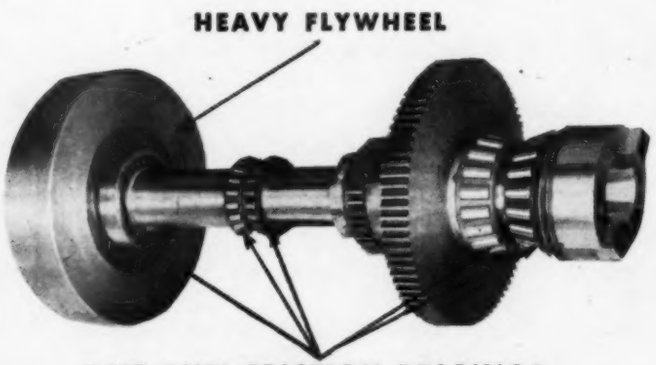
Frederick V. Geier

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

Built-In Spindle Flywheel Provides Greater Cutability, Increases Versatility of VAN NORMAN Horizontal Milling Machines





Spindle Design of New Van Norman No. 2 Heavy and No. 3 Standard.

5 anti-friction bearings . . . double-opposed in front, double-opposed center and single in rear . . . support the large alloy steel spindle. They assure maximum spindle strength and rigidity under all cuts. Heavy flywheel improves cutability.

"It Pays to Van Normanize"

VAN

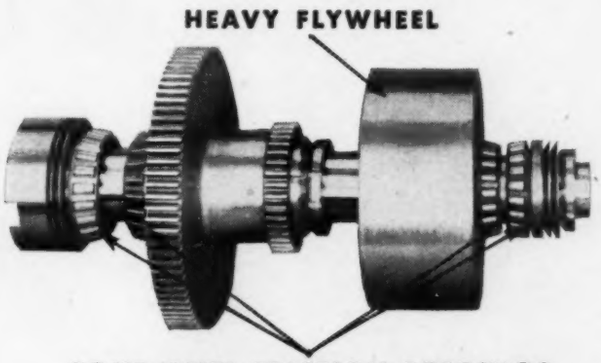
SP

ONE of the many reasons why Van Norman Horizontal Milling Machines give such outstanding performance is the built-in spindle flywheel.

This heavy flywheel, mounted inside the column, plus the large bull gear provides smooth, uninterrupted transmission of power to the cutter. Not only does this design increase cutability of the machine but it also improves the quality of work by assuring smoother finish of the work.

Van Norman Horizontal Milling Machines give you these additional advantages—front and rear controls of all power feeds including six-way rapid traverse . . . single lever speed selectors . . . large, easy-to-read dials . . . hardened alloy steel gears with larger than normal tooth area . . . automatic lubrication, alloy steel multi-splined shafts and anti-friction bearings throughout.

Investigate Van Norman Horizontal Millers, today. They are available in many models with plain or universal saddles.



Spindle Design of Van Norman No. 2 Medium.

Double-opposed front and rear bearings provide rigid support for the spindle. Large flywheel plus heavy bull gear increase cutability and versatility and improve finish of the work.

NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

LANDIS 4 Spindle

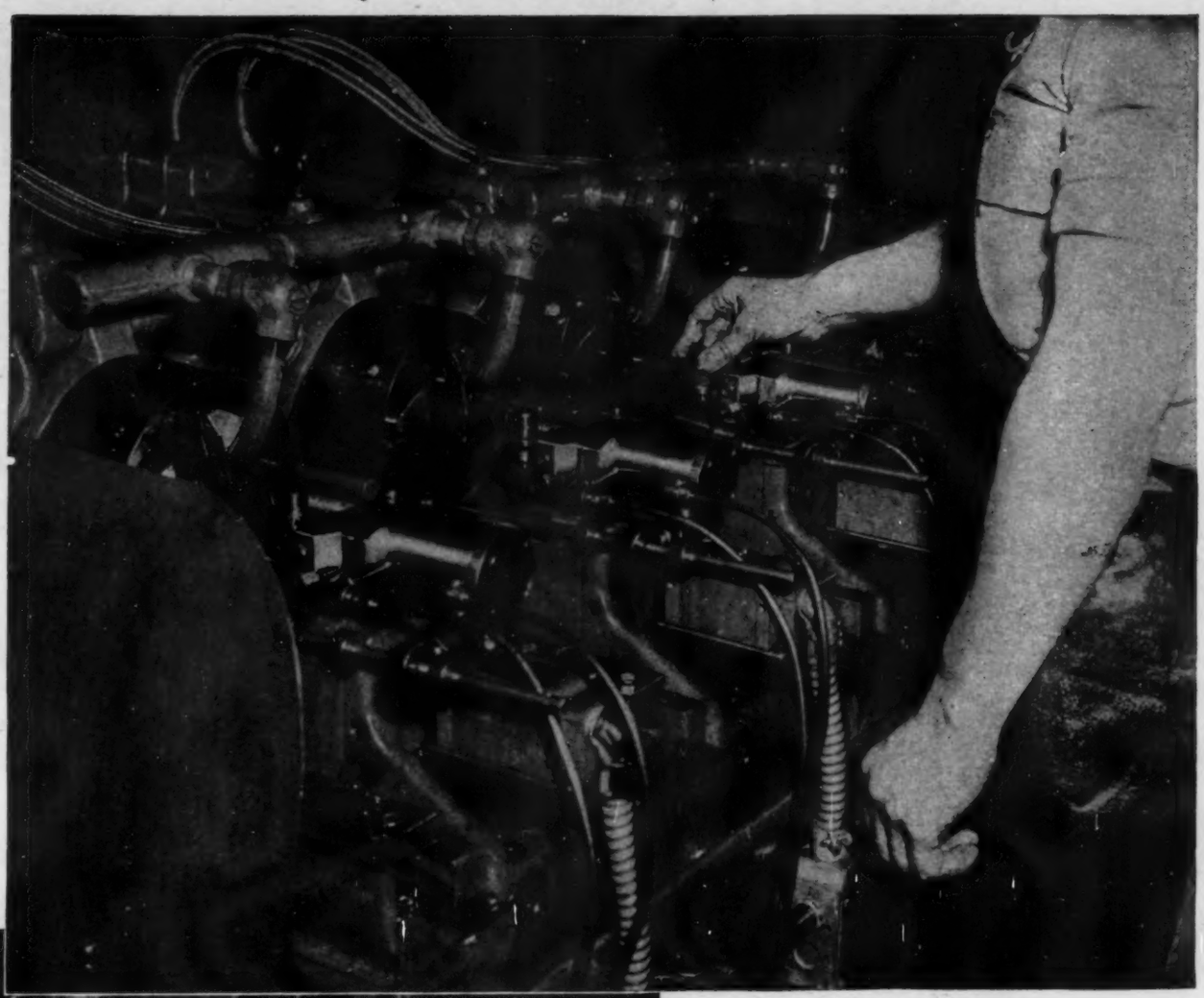
SEMI-AUTOMATIC THREADING MACHINE

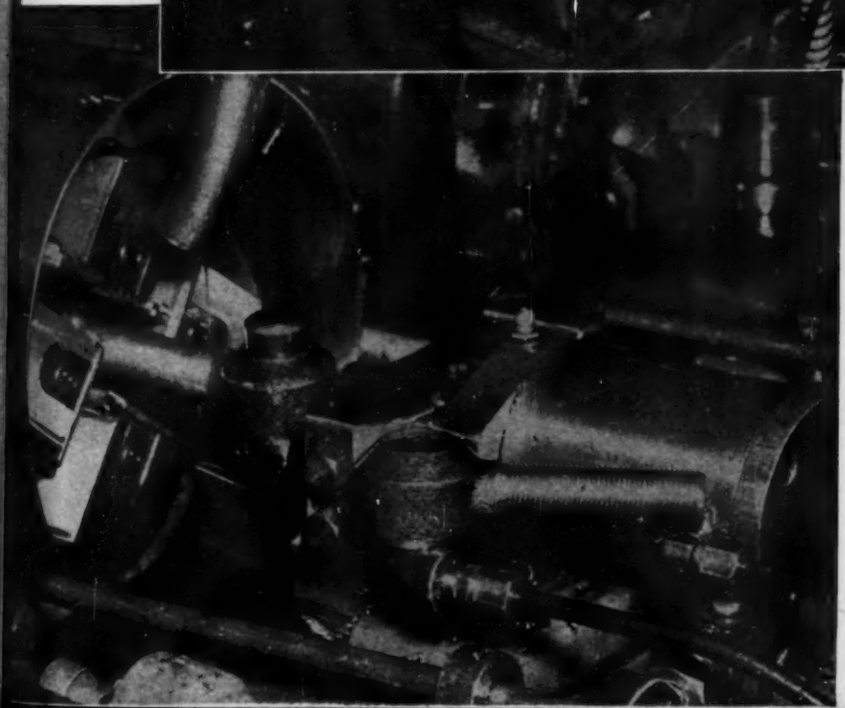
The Landis 4 Spindle Semi-Automatic Threading Machine is a precision machine designed for threading automotive parts, bolts, studs, rods, etc., on a high production basis.

Due to exclusive features in design it offers an unusually high percentage of efficiency.

Outstanding advantages are: High Production at Low Threading Speeds, Quick Set-Ups, Flexibility for all Diameters and for Special Threading Operations, Elimination of Side Shave at Start of Thread, and Thread Concentricity.

For detailed information write for Bulletin E-88.





Threading Tie Rod Ends—upset forgings — 140 to 183 Brinell hardness — 5/8" diameter — 18 pitch threads — 2.125" long — Class 3 fit—at rate of 650 per hour.

Average production ranges from 500 to 2000 pieces per hour, depending upon diameter and thread length.

LANDIS REG. U.S. TRADE—MARK PAT. OFF.

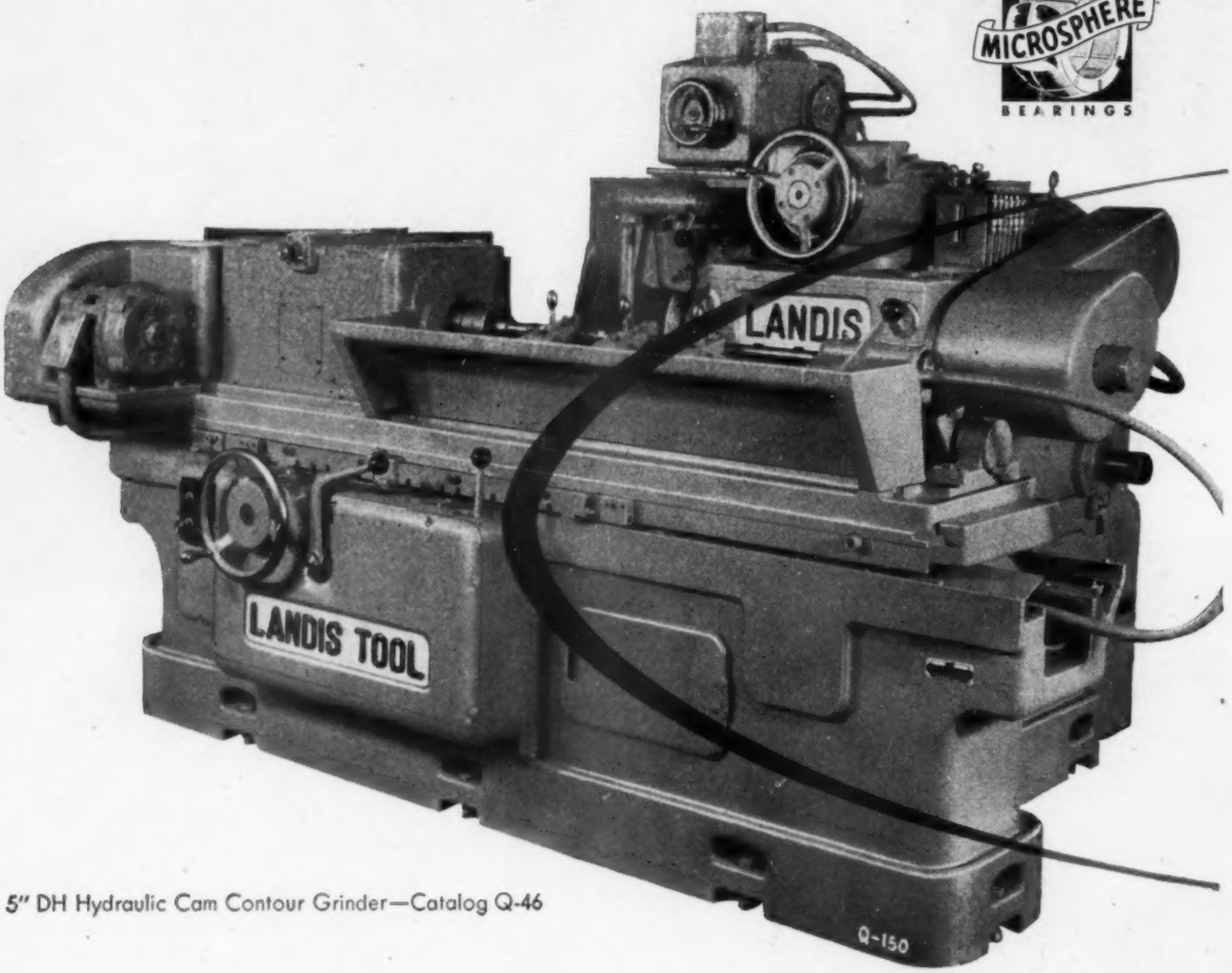
MACHINE CO. WAYNESBORO PENNA. U.S.A.

hydraulic cam contour grinder

OPERATION 80% AUTOMATIC

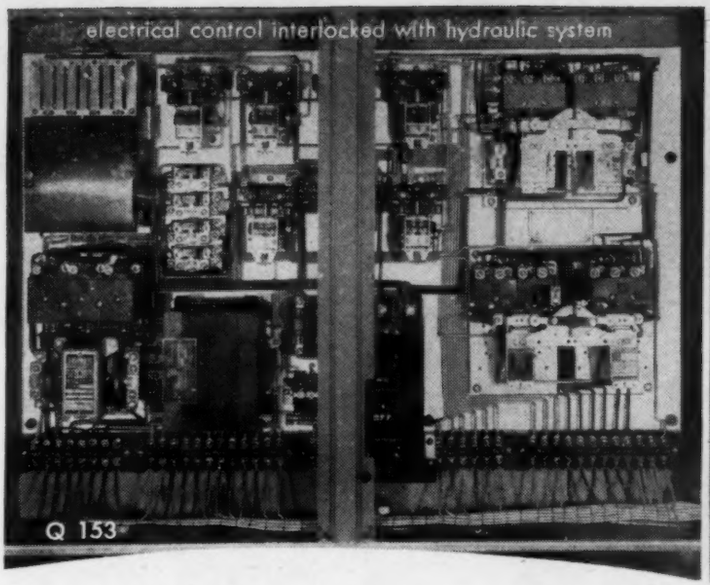
gives high production — close tolerances

EQUIPPED WITH MICROSPHERE BEARINGS



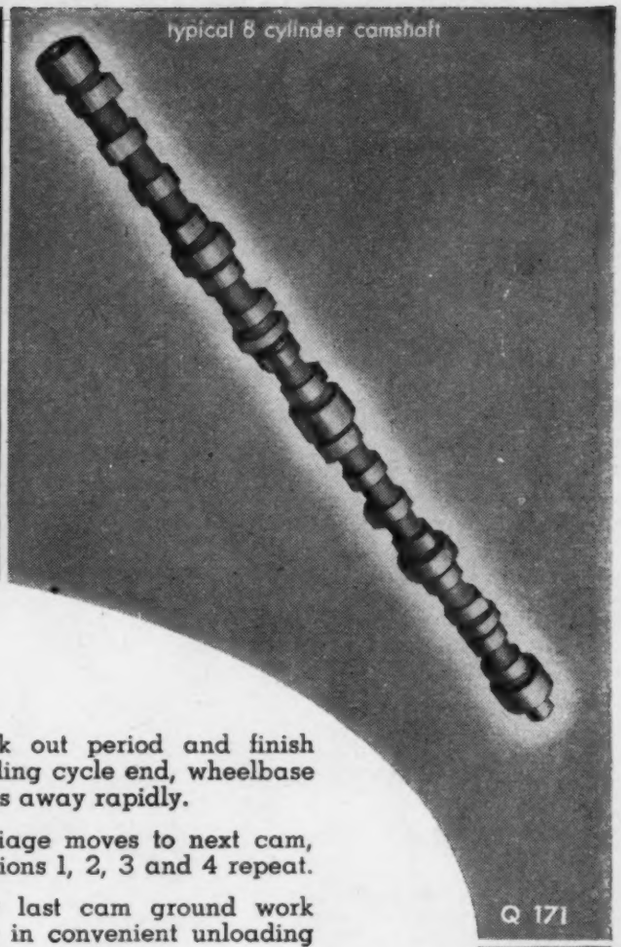
5" DH Hydraulic Cam Contour Grinder—Catalog Q-46

LANDIS TOOL
Precision Grinders



electrical control interlocked with hydraulic system

Q 153



typical 8 cylinder camshaft

Q 171

grinding cycle operation 80% automatic

manual operation

1. Operator loads machine.
2. Operator moves control lever to start position.

automatic cycle

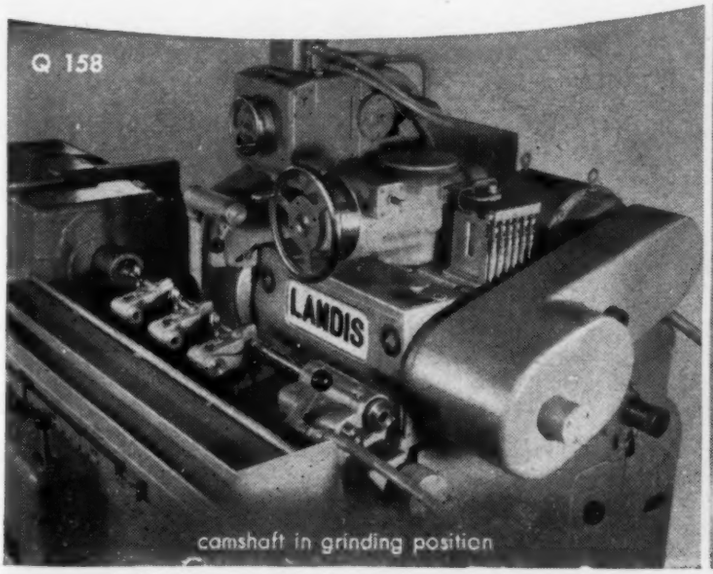
1. Carriage moves to grinding position on first cam.
2. Work rotation increases to rough grinding speed, wheelbase feeds in rapidly, wheel spindle reciprocation and grinding feed start.
3. Rough grinding ends, work rotation slows to finish grinding speed.
4. Spark out period and finish grinding cycle end, wheelbase backs away rapidly.
5. Carriage moves to next cam, functions 1, 2, 3 and 4 repeat.
6. After last cam ground work stops in convenient unloading position.

manual operation

3. Operator unloads and reloads machine. While removing finished camshaft and reloading, grinding wheel is dressed automatically

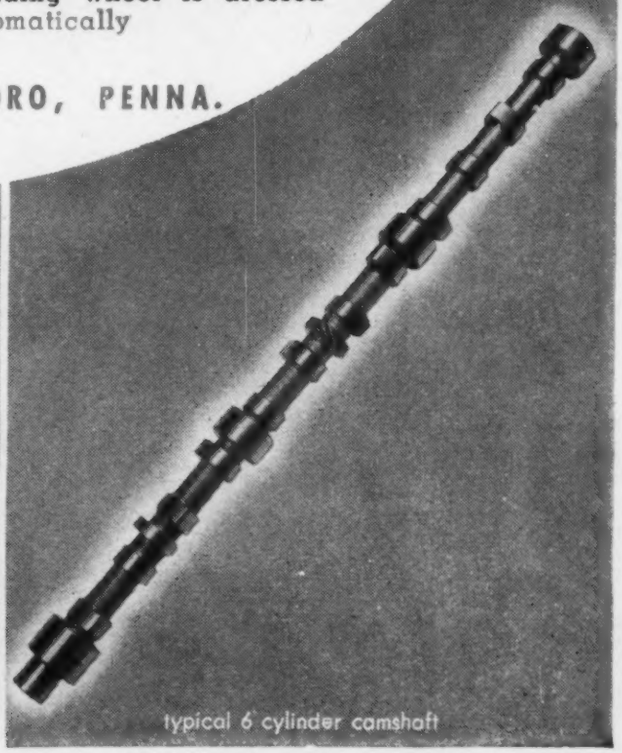
Q 170

LANDIS TOOL COMPANY, WAYNESBORO, PENNA.



Q 158

camshaft in grinding position



typical 6 cylinder camshaft

'Sure it's big work for a 20-inch lathe but she does a swell job..."

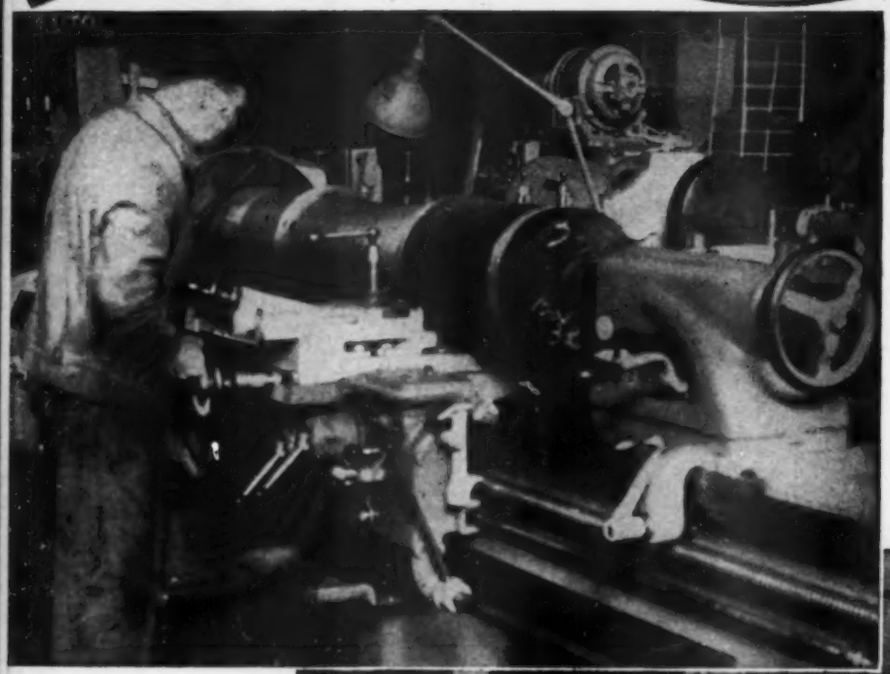
In these few words th superintendent of prominent railroad sho expressed approval of hi "AMERICAN" Pace maker Lathe.

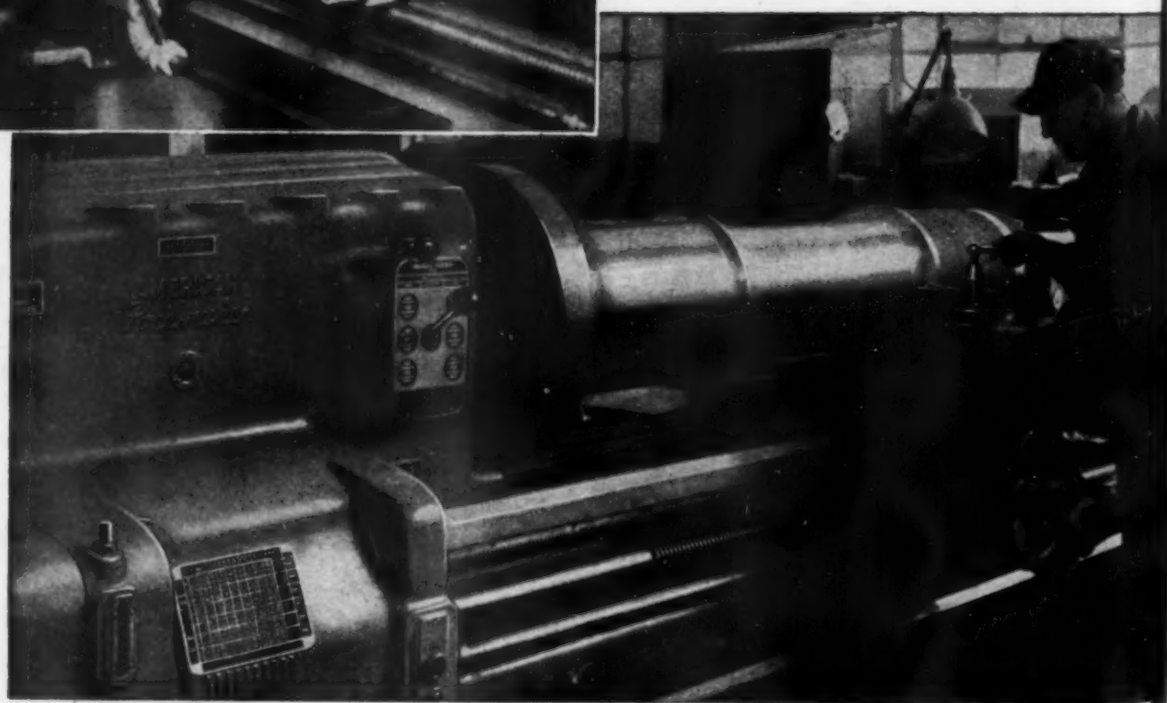
He particularly likes–

1. The power and speeds f using cemented carbide too to their limit.

2. The ruggedness and stamin which permit large work be done without chatter.

3. The ease and convenience control which saves operatin time and encourages operat to use correct speeds an feeds.





"American" Pacemaker Lathes are favorites in many of our best railroad shops. They are dependable, low-cost producers. Send for descriptive bulletin No. 16.

"American" Hole Wizard Radial Drills are also doing a fine job for the railroads.

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

Announces

Two new instruments for saving production time and materials

Here are two new G-E quality-control instruments. Like all G-E testing and measuring equipments, they have been proved in our laboratories and on our production lines.

Good quality control means a saving in hours and dollars to you. Cutting down such waste as avoidable trimmings or excessive rejects can mean big savings to you over a year's period. For help on such individual quality-control problems, state your request in detail. Our engineers can pick from hundreds of equipments to help you with quality control. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

HAND TACHOMETER SIMPLIFIES SPEED MEASUREMENT

The new hand tachometer gives you quick accurate speed indication at low cost. You can adjust the speed of such equipments as motors, cutting lathes, and other machinery to obtain the best operating conditions. Covering an unusually wide range, it weighs only seven pounds. Machinery users and manufacturers both find this new tachometer useful. Write for Bulletin GEA-4895.

METALS COMPARATOR SEPARATES METALS QUICKLY

The new metals comparator sorts metals on basis of chemical composition and heat treatment. Useful for both magnetic and non-magnetic metals. It's portable, economical with an easy-to-read scale. Saves money in metals stockroom by identifying mixed metals. Reduces cutting tool losses by separating machinable from non-machinable metals. Permits rapid inspection—1200 to 1500 parts per hour. Write for Bulletin GEA-4894.

This new Specialized Measuring and Testing Equipment Catalog contains 44 pages of the latest developments in measuring and testing equipment, giving application, description, specifications, photographs, prices and how to order. Here, in easy-to-use form, is assembled information on approximately 100 equipments. If you can use a catalog of this type, fill out the coupon completely and send it today.

NEW FREE CATALOG for REFERENCE and ORDERING

Apparatus Department
General Electric Co., Section F800-38
Schenectady 5, N. Y.

Please send me the new SPECIALIZED MEASURING AND TESTING EQUIPMENT CAT., GEA-639.

Name .....

Company .....

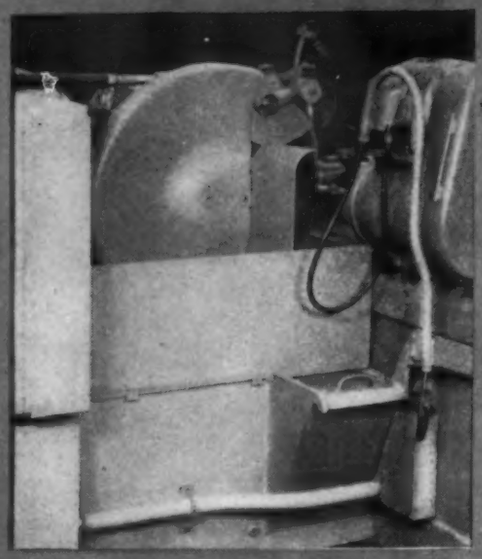
Position .....

Street .....

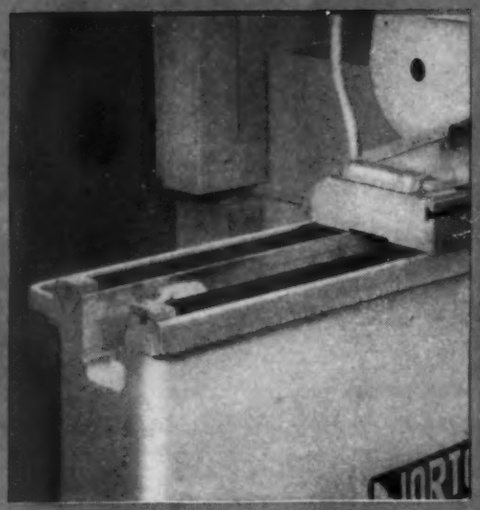
City ..... **Zone** ..... **State** .....

GENERAL ELECTRIC

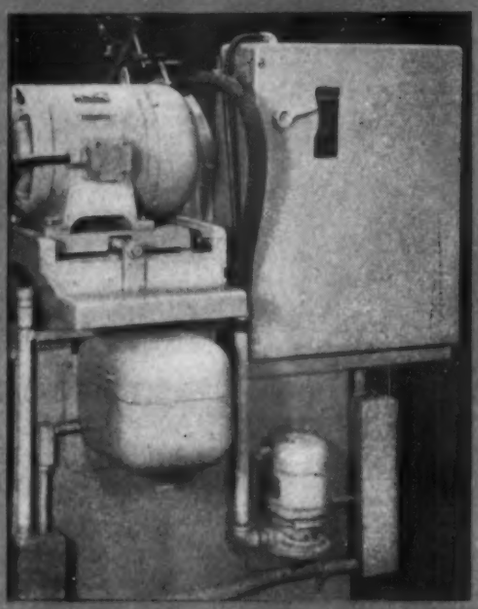
Here are the NEW features production men like



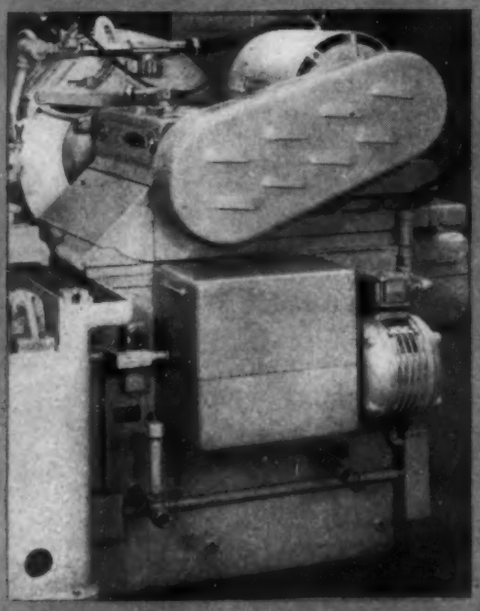
Rear base design offers maximum accessibility to hinged guard for wheel change. Note ramped outlet for easy sludge removal.



Steel ribbon type guards provide complete protection of base ways and reduce grit infiltration. Neat and compact, they require no extra floor space, and allow a more rigid table design.



Electrical equipment servicing made easy. Major controls located in elevated, accessible cabinet. Note rigid conduit.



Pumps and motors mounted outside base to insure convenience and minimum time consumption in maintenance and service.

...in the NORTON TYPE CTU CYLINDRICAL GRINDERS

FINE all around service — whether on high production, or on job lot runs — is delivered by the new NORTON type CTU 6" and 10" Cylindrical Grinding Machines.

They have increased rigidity through new features in design. This rigidity fortifies their unique ability to stand up under heavy service. It also prolongs the fine quality of precision they offer.

Easy loading, the many new features described on the opposite page, plus new flexibility and the scientific positioning of controls, all make for greater operating ease, and for the very important factors of low work and maintenance costs.

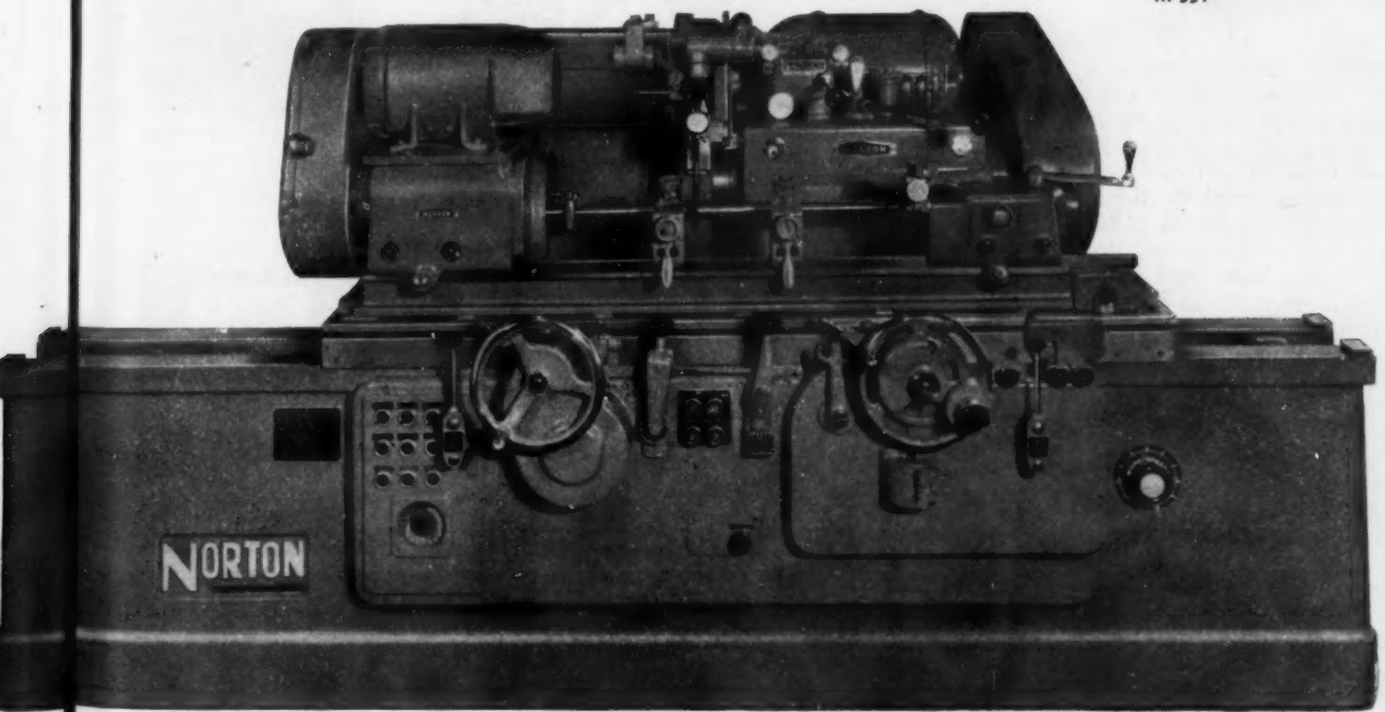
NORTON 6" and 10" Type CTU machines are made in plain and semiautomatic arrangements — write for catalog.

NORTON COMPANY, WORCESTER 6, MASS.

New York - Chicago - Detroit - Cleveland - Hartford

Distributors in All Principal Cities

M-557



The NORTON 10" x 36" Type CTU Semiautomatic Cylindrical Grinder

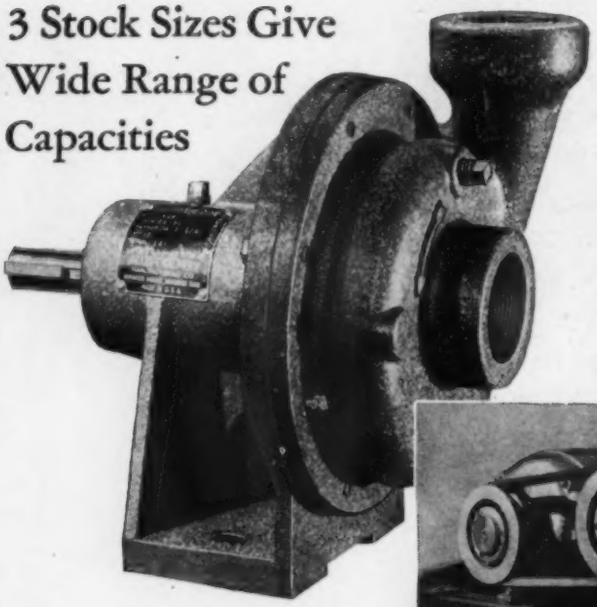
NORTON GRINDERS and Lappers

BUY THIS NEW PUMP

"Off-the-Shelf"

IT HAS MANY APPLICATIONS

3 Stock Sizes Give Wide Range of Capacities



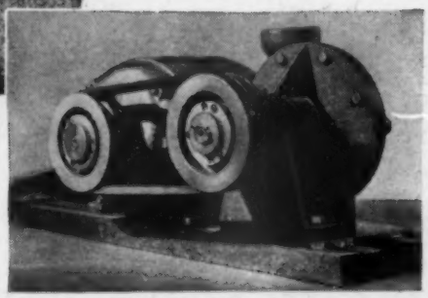
THE NEW "Pedrifugal"* Pedestal Type CENTRIFUGAL PUMP

THROUGH SIMPLE CHANGES in V-belt drive, impeller or casing these new pumps meet all average pumping requirements up to 500 gpm and heads to 100 ft.

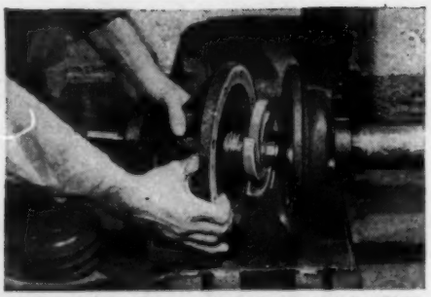
They were designed for the average user, who does not need a pump of special design or specification, but who does want a thoroughly reliable pump at a reasonable price, that he can buy right out of stock, and adapt to his needs.

The new "Pedrifugal" pump is built up to highest Allis-Chalmers standards in design, materials and workmanship. It is thoroughly tested, and backed by 65 years of engineering leadership in the design and construction of fine centrifugal pumps. Find out more about this new pump at your nearest A-C office or dealer. For specifications, ask for Bulletin 52B6691. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

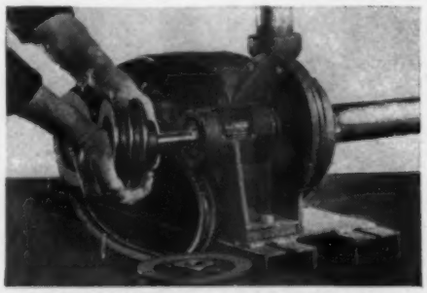
A 2306



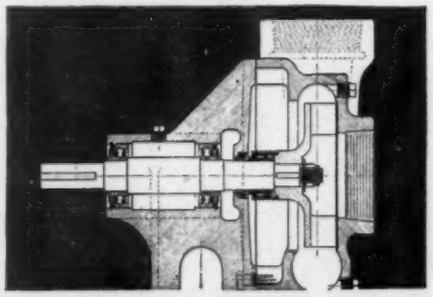
BUY IT "OFF THE SHELF" — Pump can be bought "bare" or as a complete unit pump motor, Texrope drive and welded steel base Also can be coupled or belted to a motor, a gasoline engine or power take-off which you already have.



DESIGNED AND BUILT FOR SIMPLIFIED MAINTENANCE — All moving parts quickly accessible without disconnecting pipes. No packing rings to replace . . . bearings have 3 to 5 year supply of grease under normal operating conditions.



V-BELT DRIVE GIVES GREAT RANGE OF CAPACITY — The Pedrifugal pump is specially designed for flexible TEXROPE V-belt drive Changing one sheave quickly changes speed and capacity of the pump . . . gives you great flexibility.



HIGH GRADE CONSTRUCTION — Two large ball bearings, grease sealed . . . High grade mechanical shaft seal . . . Heavy 1 in. machined shaft with *key ways* and impeller lock nut . . . Bronze open type impeller . . . Heavy, generous design throughout.

*Allis-Chalmers Trademark

ALLIS·CHALMERS

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products

TWIST DRILL

MILLING CUTTERS

HOBS

REAMERS

UNION

SAWS

GROUND FORM TOOLS

TAPS

END MILLS

DIES

GEAR CUTTERS

THE TOOLS YOU BUY AGAIN!

Union can supply the correct tool for almost every job of metal removal—drills that cut cleanly and evenly, cutters that BITE . . . and keep biting. Union tools enable you to take full advantage of the production potential of your machines. Try them on your toughest jobs, and we are sure they'll become—"the tools you buy again!"

UNION TWIST DRILL CO., ATHOL, MASS.

UNION . . . . BUTTERFIELD . . . . S. W. CARD
DIVISIONS OF THE UNION TWIST DRILL CO.

STORES:

New York: 61 Reade Street
Detroit: 5527 Woodward Ave.
Los Angeles: 524 E. Fourth St.
Chicago: 11 So. Clinton St.
San Francisco: 121 Second St.
Seattle: 568 First Ave., So.

BUTTERFIELD

"Thred-Rite" DIES

Graduated micrometer lock nut adjustment can be set to split thousandths! Full floating design assures accurately centered work! Rugged construction holds accuracy under high speed, heavy duty operation! Use the simple, accurate, efficient "Thred-Rite" Die on jobs where accuracy must be maintained with minimum attention. They are built in a full range of standard sizes, with NC or NF threads, in carbon or high speed steel. Get full details from your nearest Butterfield store.

BUTTERFIELD DIVISION

DERBY LINE, VERMONT

ROCK ISLAND, QUEBEC

Union . . . . Butterfield . . . . S. W. Card

Divisions of the Union Twist Drill Co.

STORES: NEW YORK: 61 Reade Street. CHICAGO: 11 So. Clinton Street. CLEVELAND: Hal W. Reynolds, 2902 Euclid Avenue. DETROIT: 5527 Woodward Avenue. LOS ANGELES: 524 East Fourth Street. TOLEDO: 3636 Detroit Avenue: TORONTO: 137 Wellington Street, West. MONTREAL: 111 St. Paul Street, West. WINNIPEG: 212 Bannatyne Avenue. VANCOUVER: 119 Pender Street, West. GREAT BRITAIN: Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S. E. 11, England. Branches at Birmingham, Manchester, Glasgow, Bristol and Newcastle-on-Tyne.

CARD

THE RIGHT ANSWER TO EVERY TAPPING PROBLEM

More and more tap users are specifying CARD for every tapping job. They know that it pays to go to a specialist. They know that they can get the right answer to every tapping problem from this single, convenient, complete source of supply. They know that—in the test of service—Card Taps have given them long runs of threads, high output on all types of materials and under all conditions, and precision results that satisfy their most exacting demands.

S. W. CARD MFG. CO.

MANSFIELD, MASS.

Union . . . . Butterfield . . . . S. W. Card
Divisions of the Union Twist Drill Co.

STORES:

NEW YORK:
61 Reade Street

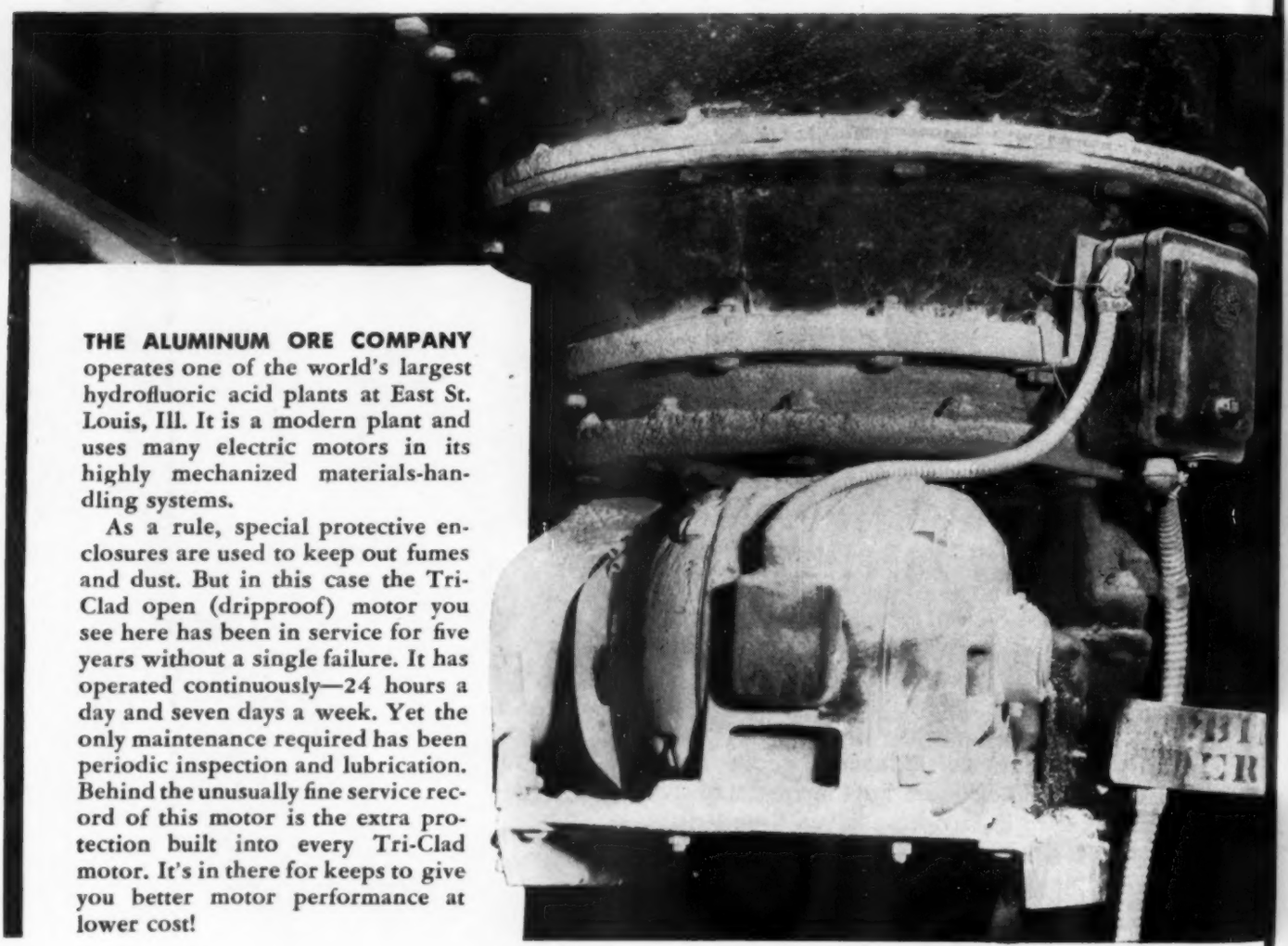
CHICAGO:
11 South Clinton Street

DETROIT:
5527 Woodward Avenue

LOS ANGELES:
524 East Fourth Street

SEATTLE:
568 First Avenue, South

4 MILLION HP



THE ALUMINUM ORE COMPANY operates one of the world's largest hydrofluoric acid plants at East St. Louis, Ill. It is a modern plant and uses many electric motors in its highly mechanized materials-handling systems.

As a rule, special protective enclosures are used to keep out fumes and dust. But in this case the Tri-Clad open (dripproof) motor you see here has been in service for five years without a single failure. It has operated continuously—24 hours a day and seven days a week. Yet the only maintenance required has been periodic inspection and lubrication. Behind the unusually fine service record of this motor is the extra protection built into every Tri-Clad motor. It's in there for keeps to give you better motor performance at lower cost!

The toughest TRI CLAD ever built!

Newest addition to the Tri-Clad motor family is the Tri-Clad totally enclosed, fan-cooled motor. It is designed for use in adverse atmospheres—in iron dust, out-of-doors, in hazardous areas, and chemical atmospheres. Available in both standard and explosion-proof types, this motor gives you these important construction features:

- A cast-iron, double-wall frame which completely encloses and protects the windings and punchings.
- A non-shrinking compound around motor leads which protects motor interior from dust and moisture.
- A rotating labyrinth seal which further protects the motor interior from damage by foreign matter.

CONFIRMS IT!

FOR TOUGH MOTOR JOBS, YOU CAN'T BEAT

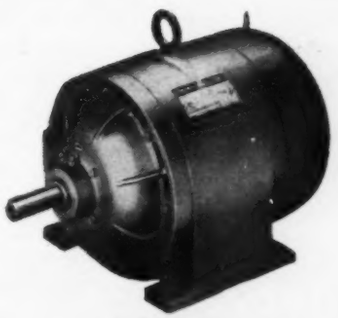
TRI CLAD

EXTRA PROTECTION

To date, a million and a half Tri-Clad motors, with a total output of over 4-million horsepower, have been purchased by American industry!

In every kind of plant from steel mill to dairy, these motors are proof beyond doubt that you can't beat Tri-Clad extra protection for tough motor applications. Even on jobs where special protective enclosures would ordinarily have been specified, Tri-Clad open motors, applied during the war years, have stood up to heat, dust, and dampness, operating smoothly and efficiently for years with only minimum maintenance.

Today, the Tri-Clad family includes many different types and sizes. But whatever your selection, the Tri-Clad motor nameplate is still your best assurance of a high return on your motor dollar. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



EXTRA PROTECTION . . . *AGAINST PHYSICAL DAMAGE!*

Rigid cast-iron frame and end shields protect vital motor parts from external abuse. Because they're not at the mercy of a coat of paint, they strongly resist chemical attack and dampness. Cast iron also gives you wide nonyielding metal fits between end shields and frame for ease of assembly

EXTRA PROTECTION . . . *AGAINST ELECTRICAL BREAKDOWN!*

Motor windings of Formex* wire, together with improved insulating materials reduce the chances of electrical failure. Heat is dissipated quickly—motor stays young for years and years!

EXTRA PROTECTION...*AGAINST OPERATING WEAR AND TEAR!*

Bearing design affords longer life, greater capacity, improved lubrication features. Bearing seals retain lubricant, keep out dirt. One-piece, cast-aluminum rotor is practically indestructible.

**Trade-mark reg. U.S. Pat. Off.*

GENERAL ELECTRIC

750-297

TRI CLAD

REG. U.S. PAT. OFF.

MOTORS

- OPEN (DRIPPROOF)
- TOTALLY ENCLOSED
- EXPLOSION-PROOF

BETHLEHEM *Complete* ★ TOOL STEEL SERVICE

CARBON AND CARBON-VANADIUM TOOL STEELS

OIL- AND AIR-HARDENING TOOL AND DIE STEELS

SHOCK-RESISTING STEELS

HIGH-SPEED STEELS

★ **PROMPT DELIVERIES.** Prompt delivery to mill customers and distributors is a daily service, not just a promise. Selected tonnages of standard tool, die and high-speed steels are stocked in popular sizes and sections at Bethlehem's tool steel mill depot for shipment by rail and truck.

★ **QUALITY STEELS.** Bethlehem Tool Steels are produced in a completely modern tool-steel mill. A rigid control and inspection system assures the highest in quality for each grade of steel.

★ **METALLURGICAL SERVICE.** Bethlehem metallurgists are on call whenever you have problems. They'll assist with the selection of tool steel . . . or its proper heat-treatment, forging, machining, etc.

★ **DISTRIBUTORS AND OFFICES EVERYWHERE.** Distributors of Bethlehem tool steel have warehouse stocks at the locations shown by circles. The stars indicate Bethlehem district offices and resident representatives.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

BETHLEHEM TOOL STEELS for EVERY JOB

A STAND-OUT

among 3 miles of exhibits at the Machine Tool Show

If you attended the 1947 Machine Tool Show in Chicago, certain items in that nine-day parade of wonders will remain in your mind as real "show-stoppers".

For example, you'll surely remember — at BULLARD'S outstanding booth — one of the Show's most widely discussed machines . . .

The New Bullard 30H Man-Au-Trol Horizontal Lathe

(ILLUSTRATED AND DESCRIBED ON FOLLOWING PAGES)

If you weren't able to get to Chicago, all the more reason why you'll want to get up to date on the Show's outstanding attractions. That's why the following two pages bring you the facts on one of the latest BULLARD milestones in machine tool development.

In reading them, remember that the BULLARD organization itself is truly a *perpetual* Machine Tool Show — where valuable new production helps, and new methods for using them, are continually being created for industry.

BULLARD MAN-AU-TROL

MASTER OF THE MACHINE

BULLARD CREATES *NEW METHODS* TO MAKE MACHINES DO MORE

PRODUCTION NEWS!
a new era in shaft-turning
The new BULLARD MAN-AU-TROL HORIZONTAL LATHE
Model 30H produces three identical parts at once...
with interchangeable manual or automatic control!
BULLARD
MAN-AU-TROL
MASTER OF THE MACHINE
HORIZONTAL LATHE
Model 30H
BULLARD CREATES NEW METHODS

On shaft-turning, grooving, facing, angle-turning or between-center chucking jobs, you can multiply your present output with the new BULLARD Man-Au-Trol 3-Spindle Horizontal Lathe—and reduce costs proportionately.

But that's only part of the economy-story. You'll find this latest BULLARD machine a radical departure from conventional design, with many improvements contributing to better workmanship and further savings in time and money.

NO OTHER SHAFT-TURNING LATHE OFFERS ALL THESE ADVANTAGES

All 3 spindles are equipped with hydraulic, centering-type, lever-gripping chucks. These chucks function two ways: a center extends to pick up the work, which is then gripped by two hydraulically operated levers, eliminating the use of driving dogs.

Man-Au-Trol control, head stock and all other machine-operating controls are located at operator's right.

Each hydraulic chuck is operated by an individual foot-treadle, allowing operator unrestricted use of both hands.

Both saddle and tool slide travel on vertical bearing ways, entirely free of the chip area.

An automatic feed interrupter breaks the chips to desired lengths for easy removal from the chip receiver.

Vertical construction of saddle and saddle ways allows chips to fall freely into receiver without accumulating around operating parts.

Work and tools are always visible and easily accessible to the operator without reaching across tool slide and tools.

Massive weight and firm application of all components provide extreme rigidity, assuring minimum vibration and maintained accuracy.

PLUS THE ADVANTAGES OF BULLARD MAN-AU-TROL

Man-Au-Trol has given complete proof on other BULLARD lathes of its amazing ability to lower costs by upping productivity, versatility and accuracy. When in manual operation for shorter runs, functions are performed faster than with most types of manually operated lathes. On longer runs of ten or more pieces it enables quick conversion to 100% automatic operation. Controlling the head through ***39 separate functions in any sequence***, it enables the machine to cut practically continuously. With the lathe set for fixed maximum production, there are no stops for customary manual operations, no loss of time due to the human element, and output is stepped up 4 ways:

1. ***Lightens Labor's Load*** because the operator machines the first piece under manual control while easily setting the operations for automatic cycle . . . then merely loads, supervises and unloads when Man-Au-Trol's 100% automaticity takes over.

2. ***Makes One Machine Do More*** because it automatically machines any class of work within manual-control range . . . is instantly convertible to manual operation on the same or a different piece without affecting the automatic cycle.

3. ***Cuts Automatic Set-Up Time*** because set-up time from one class of work to another is only slightly more than for a manually operated machine.

4. ***Reduces Spoilage*** because it operates continuously to a degree of accuracy manual operation cannot duplicate.

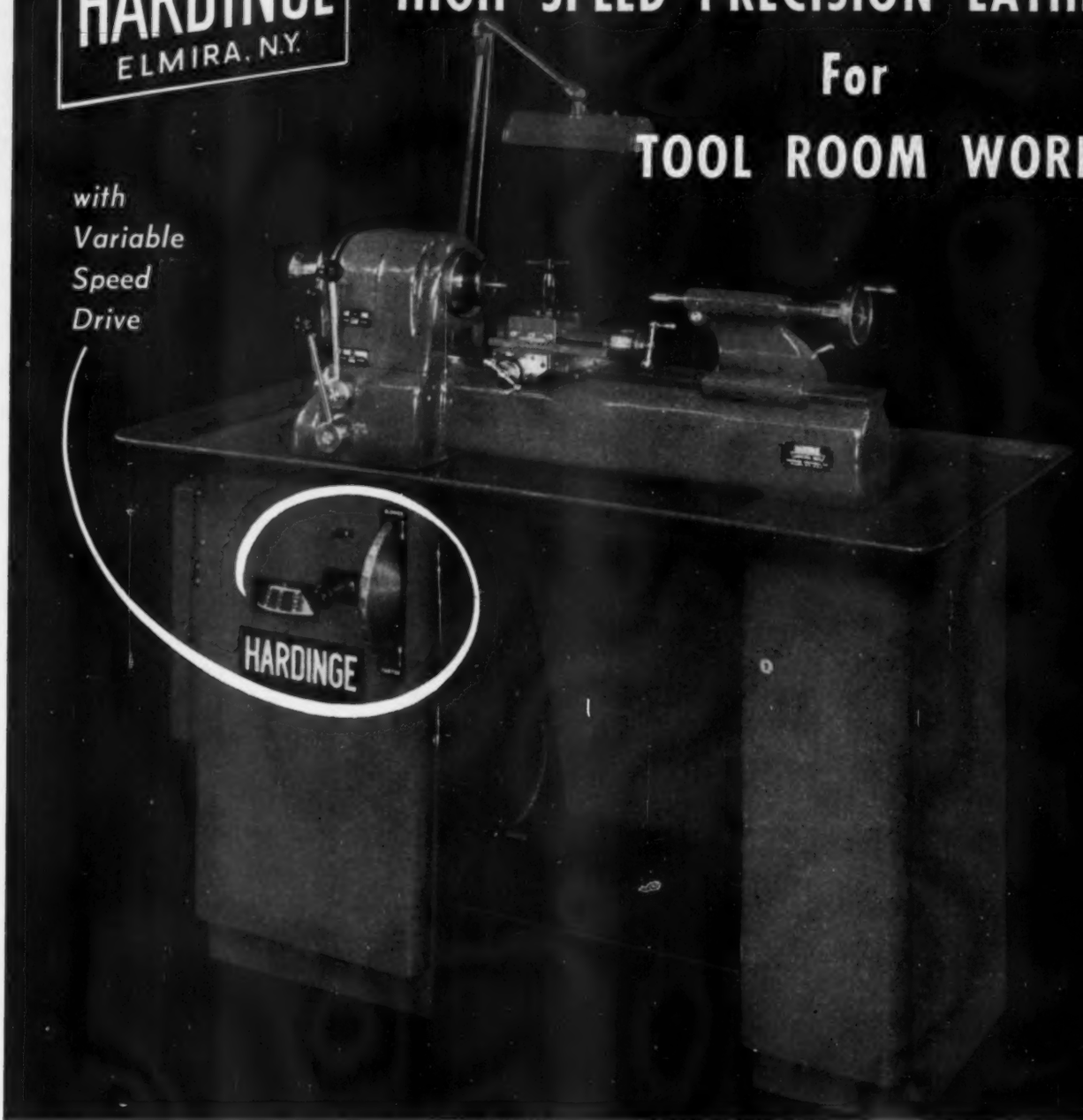
So, while retaining the versatility of manual control for short runs, this new BULLARD Man-Au-Trol machine can be quickly changed to fully automatic operation on production of 3 identical parts at once — substantially lowering manufacturing costs. Why not find out how this revolutionary, cost-saving combination can benefit your own production? Engineering data and other facts on the new BULLARD Man-Au-Trol 3-Spindle Horizontal Lathe gladly sent on request. THE BULLARD COMPANY, Bridgeport 2, Connecticut.

TO MAKE MACHINES DO MORE

HARDINGE
ELMIRA, N.Y.

HIGH SPEED PRECISION LATHE For TOOL ROOM WORK

with Variable Speed Drive



OTHER FEATURES:

Hardinge Dovetail Bed with Hardened and Ground Steel Ways • Free-Spindle Clutch • Headstock with Center Drive • Patented Positive Lock Slide Rest • Full Bearing Tailstock Spindle • Fluorescent Type Lamp • Large Tool Storage Compartment

SPECIFICATIONS

1″ collet capacity
9″ swing, 17″ center distance
Infinitely Variable Speed
from 90 to 3400 r.p.m.

Write for Bulletin WE59

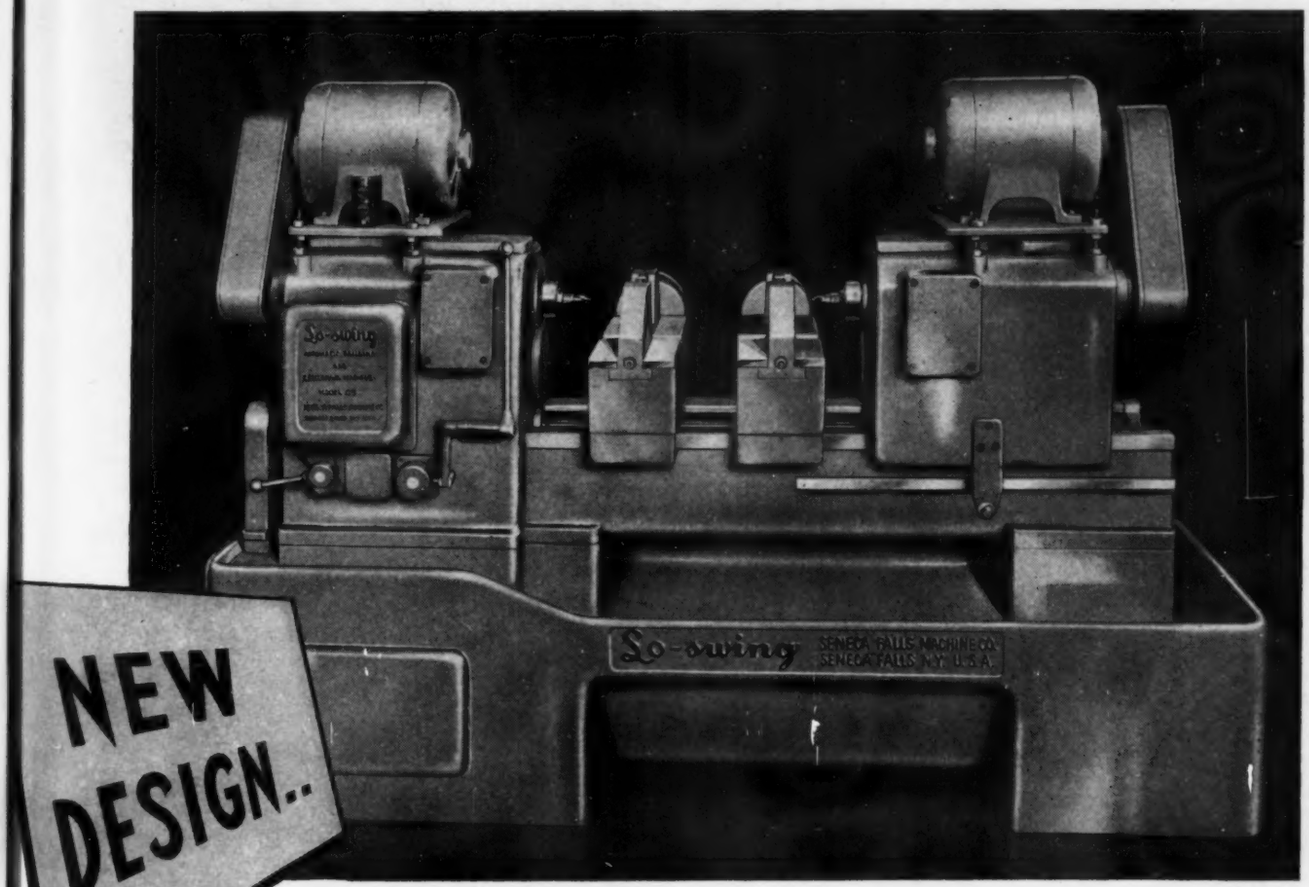
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Offices in principal cities. Export office, 269 LaFayette St., New York 12, N. Y.

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK



NEW DESIGN..

Lo-swing AUTOMATIC DRILLING & CENTERING MACHINE DESIGNED FOR EITHER LONG OR SHORT-RUN JOBS

● Since its introduction at the Machine Tool Show, the Lo-Swing Model "CS" Automatic Drilling and Centering Machine has demonstrated its versatility as an economical producer on both mass production and short-run jobs. Because of its quick change-over features, speeds and feeds are quickly changed and its built-in, adjustable rapid traverse mechanism reduces automatic cycle time to a strict minimum.

Two independent, motor-driven heads permit operation at correct spindle speeds for each head when different sized drills or combination countersinks are used. The drilling spindles are cam operated and positive in action. The cams will operate for any depth of cut within the capacity of the machine and do not require changing.

The rapid traverse mechanism for both centering heads is controlled by cams which are pre-set to a graduated dial, doing away with inefficient "set and try" methods.

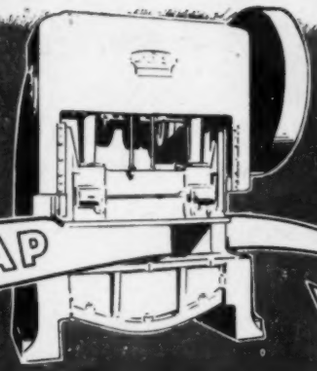
Standard, quick-acting, equalizing, air-operated vises are available and may be arranged to operate singly or in pairs. Ample distance from the bed to the spindle provides sufficient room for special work-holding fixtures which are available as extra equipment. Electric motors are the standard foot mounting type and may be furnished in sizes from 1 to 3 H.P.

The Model "CS" Automatic Centering Machine is manufactured in four standard sizes, 18″, 42″, 66″ and 90″ between drills. Seneca Falls engineers will welcome an opportunity to assist in the solution of your centering problems. Write for full information on this new cost-cutting equipment.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

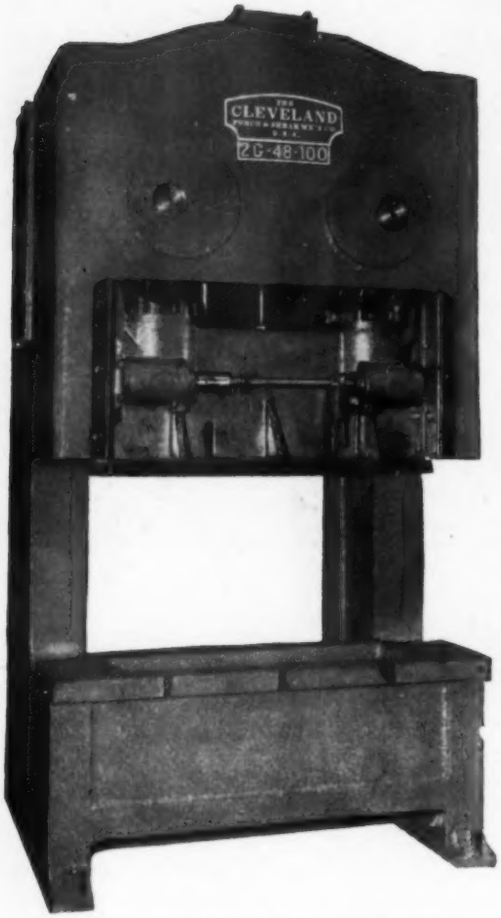
PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

CLEVELAND OPEN BACK GAP PRESSES

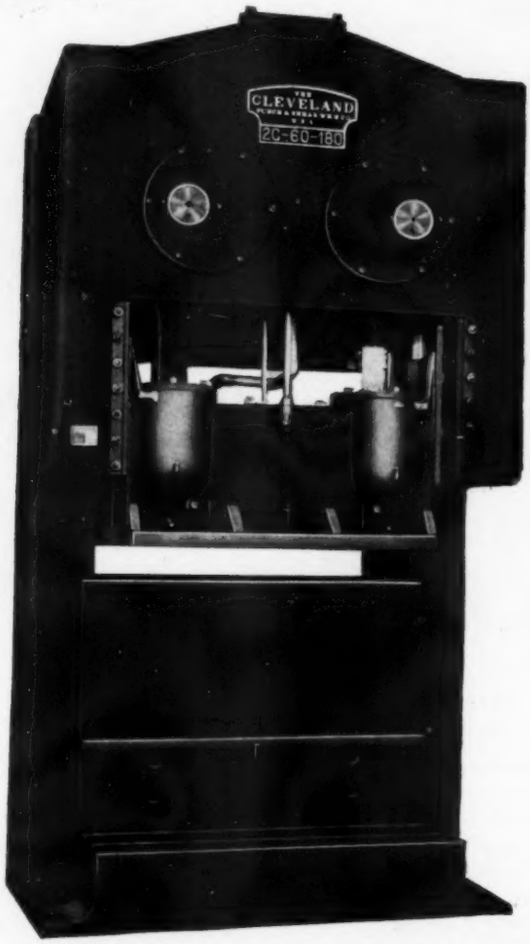


This line of Cleveland Open Back Gap Presses combines the Modern stream line design, which not only assures more efficient operation and longer life but also reduces floor space to a minimum, with the overhanging gap and open back features which afford greater convenience in the handling of large or irregular sheets and for feeding material right and left across the dies.

Built in a wide range of sizes and capacities, these Presses can be furnished with standard bed, or with the bed cut back to accommodate various tables, as shown by the illustrations. This is but one of the fourteen different types of Mechanical Power Presses built by Cleveland for efficiency of operation and economy in the production of Pressed Metal parts.



Cleveland Two Point Gap Press, Twin Drive, equipped with Air Friction Clutch, air counterbalance to slide, stroke 8", adjustment 4", shut height 24", R.P.M. 35, capacity 100 tons.



Cleveland Two Point Gap Press, flush front, equipped with air friction clutch and separate air brake on flywheel. Stroke 12"—Adjustment 4", Shut Height 54", R.P.M. 35, Capacity 180 tons.

CLEVELAND

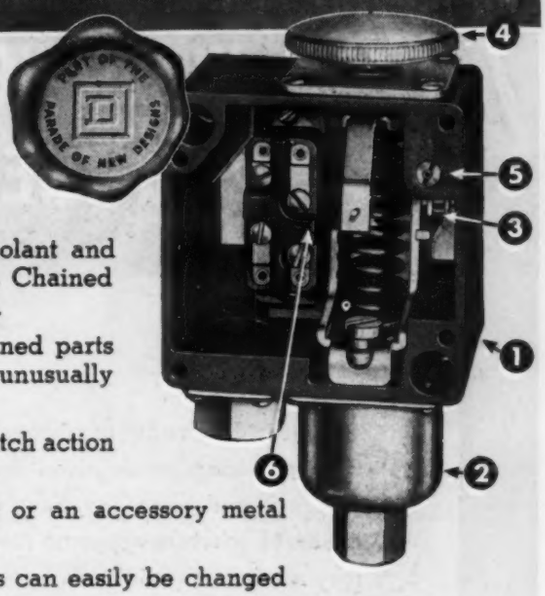
THE CLEVELAND PUNCH & SHEAR WORKS CO.

CLEVELAND 14, OHIO

NEW YORK · CHICAGO · DETROIT · PHILADELPHIA · PITTSBURGH

NEW Pressure Switch Designed for Machine Tool Service

These Construction Features Make it a Better Pressure Switch for Machine Tool Applications:



1 ENCLOSURE: Gasketed, die cast construction is oil, coolant and moisture tight. Mounting holes are sealed by cover gasket. Chained cover has self-retaining screws. Conduit hub is detachable.

2 MECHANISM: Bellows are heavy wall, seamless. Hardened parts and short travel characteristic of operating mechanism insure unusually long mechanical life.

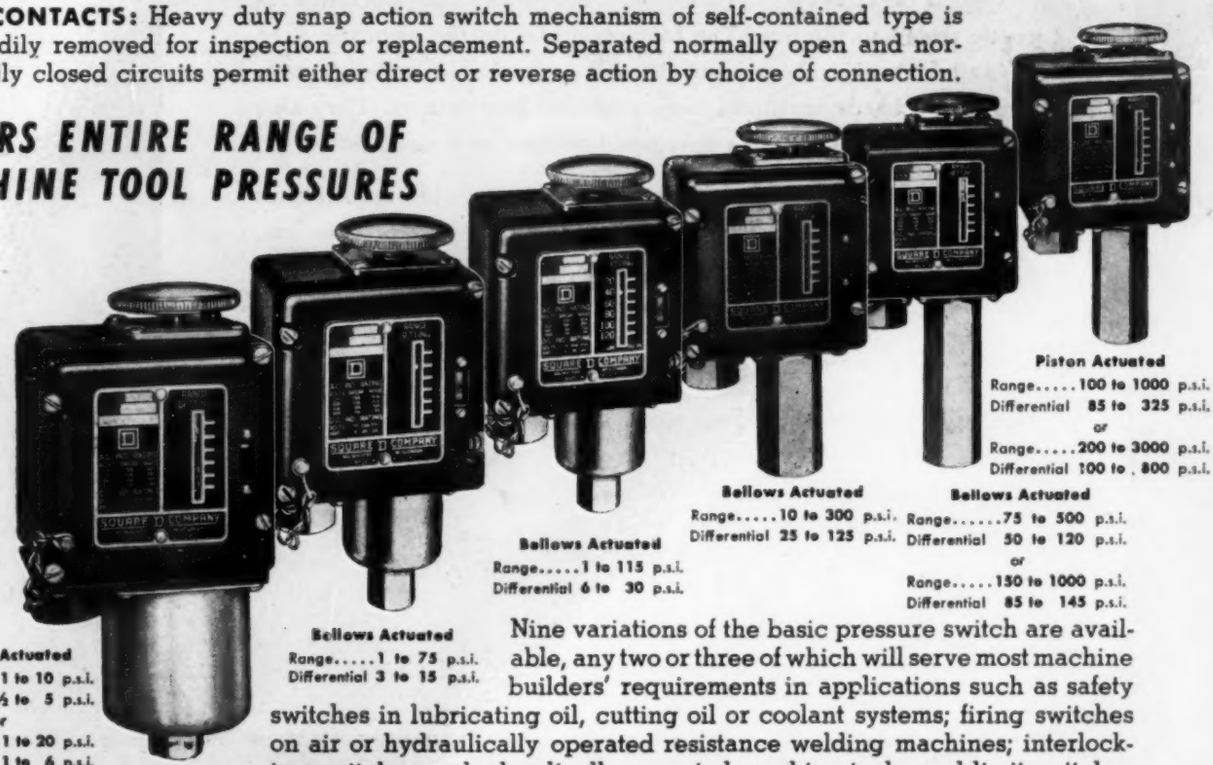
3 INDICATOR: Lever motion permits easy observation of switch action through window in cover, to assist in proper setting.

4 RANGE: Settings, externally adjustable by screw driver or an accessory metal knob, are indicated on scale.

5 DIFFERENTIAL between "cut-in" and "cut-out" pressures can easily be changed by a set-screw adjustment accessible with cover removed.

6 CONTACTS: Heavy duty snap action switch mechanism of self-contained type is readily removed for inspection or replacement. Separated normally open and normally closed circuits permit either direct or reverse action by choice of connection.

COVERS ENTIRE RANGE OF MACHINE TOOL PRESSURES



Bellows Actuated
Range..... 1 to 10 p.s.i.
Differential ½ to 5 p.s.i.
or
Range.....1 to 20 p.s.i.
Differential 1 to 6 p.s.i.

Bellows Actuated
Range.....1 to 75 p.s.i.
Differential 3 to 15 p.s.i.

Bellows Actuated
Range.....1 to 115 p.s.i.
Differential 6 to 30 p.s.i.

Bellows Actuated
Range.....10 to 300 p.s.i.
Differential 25 to 125 p.s.i.

Bellows Actuated
Range.....75 to 500 p.s.i.
Differential 50 to 120 p.s.i.
or
Range.....150 to 1000 p.s.i.
Differential 85 to 145 p.s.i.

Piston Actuated
Range.....100 to 1000 p.s.i.
Differential 85 to 325 p.s.i.
or
Range.....200 to 3000 p.s.i.
Differential 100 to 800 p.s.i.

Nine variations of the basic pressure switch are available, any two or three of which will serve most machine builders' requirements in applications such as safety switches in lubricating oil, cutting oil or coolant systems; firing switches on air or hydraulically operated resistance welding machines; interlocking switches on hydraulically operated machine tools; and limit switches on hydraulic presses.

Write for Bulletin 9012-A. Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D CANADA, LTD., TORONTO, ONTARIO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

Look to the Future...

WHEN YOU BUY MACHINES FOR THE PRESENT

● Extra "dividends" can be realized by selecting machines that have unusually long, productive life as well as simplified operation, high accuracy, and versatility. Such dividends are common from Brown & Sharpe machines because they are designed to give long, satisfactory service in addition to other important advantages.

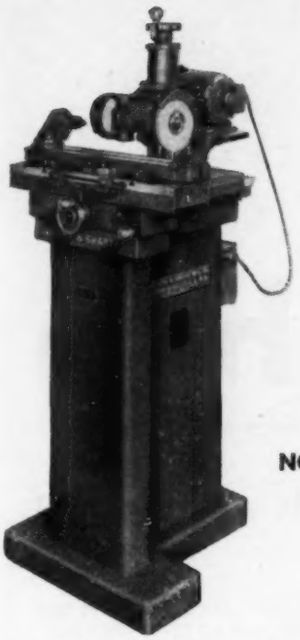
Typical examples of this show up in the many new machines recently added to the line. The four machines on the opposite page have all the basic and enduring characteristics that have always made Brown & Sharpe machines *extra-profitable* investments. They also have many unique features developed to meet new conditions.

Consider long, trouble-free service life as a major requirement when selecting a machine. Investigate the Brown & Sharpe line. Complete details on any of the machines listed below will be sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

MILLING MACHINES	GRINDING MACHINES	SCREW MACHINES
Universal	Universal	Automatic (including screw threading, pinion turning and cutting-off type)
Plain (including manufacturing type)	Plain	Wire Feed
Vertical	Surface	
	Cutter & Tool	

A Broad Line of Modern Designs

BROWN &



NEW!

NO. 5 CUTTER AND TOOL GRINDING MACHINE

Fast and handy, particularly for sharpening small cutters and end mills. Centers swing 6⅜" diameter, take 17½" length. Maximum longitudinal table travel, 6". Maximum length of work ground on centers, 4".

NEW!

AUTOMATIC SCREW THREADING MACHINE

For high speed production of screws or similar parts requiring threading, forming, cutting-off and slotting . . . featuring overlapping operations. Wide range of speeds and feeds. Takes stock to ⅜" diameter. Threads any length to 1".

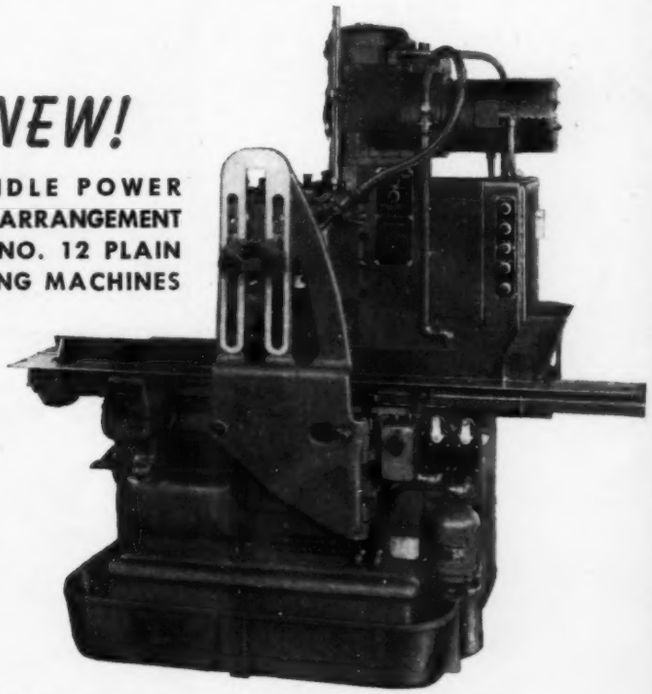
NEW!

AUTOMATIC PINION TURNING MACHINE

For staff and pinion work of high accuracy requiring single point turning operations. Takes stock to ¼" diameter and turns up to 2⅞" length. Unique method of setting tools for quick and accurate duplication.

NEW!

SPINDLE POWER FEED ARRANGEMENT FOR NO. 12 PLAIN MILLING MACHINES



With this device, settings can be made to accurately position the cutter at two different heights in any cycle and to raise or lower the cutter several times during any cycle.

SHARPE

B·S

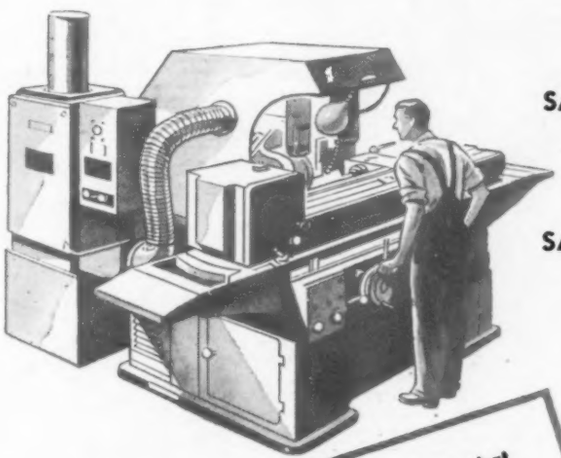
*Precipitron** BANISHES

PRECIPITRON* UNIT FOR INDIVIDUAL MACHINE TOOL APPLICATION

EXHAUST FAN — 600 CFM CAPACITY AT 1½" STATIC AND RATED MOTOR SPEED.
POWER PACK PROVIDES D-C VOLTAGE TO SET UP THE ELECTROSTATIC FIELD AND ENERGIZE THE COLLECTOR PLATES.
CHARGED PARTICLES ARE DRAWN TO AND PRECIPITATED ON THESE COLLECTOR PLATES.
6KV 13KV
ELECTROSTATIC FIELD IS CREATED IN THE IONIZER WHICH CHARGES ALL DUST, DIRT AND OIL PARTICLES AS THEY ENTER.
AIR DUCT FROM MACHINE TOOL (OR TOOLS) THROUGH WHICH COOLANT MIST ENTERS UNIT.
MECHANICAL FILTER REMOVES LARGE METALLIC AND ABRASIVE PARTICLES.
DRAIN AT BOTTOM OF UNIT, PERMITTING OIL TO GRAVITATE BACK TO OIL RESERVOIR.

OIL MIST HAZARDS

That's right! Serious fire and personnel safety hazards caused by oil coolant mists disappear as if by magic when Precipitron is installed. For this electronic air cleaner removes oil mists right at the source—at the high-speed cutting and grinding machines. The millions of oil particles that normally penetrate through whole departments, adhering to lighting fixtures, bus ducts, wiring and floors are captured—the air throughly cleaned for recirculation—and the cutting oil salvaged for re-use.



Check these Savings

SAVES OIL—Precipitron separates the oil from the cleaned air, salvaging as high as 5 gallons per day on individual machine tools. The oil gravitates back to the oil reservoir, eliminating frequent shutdowns for cleaning.

SAVES CLEANING—Precipitron not only promotes safer working conditions, thus improving output—but cuts down tremendously on cleaning time spent by machine operators and cleaning crews. Prevents oil mist from condensing on cooling surfaces of air conditioning systems, helping to maintain efficiency.

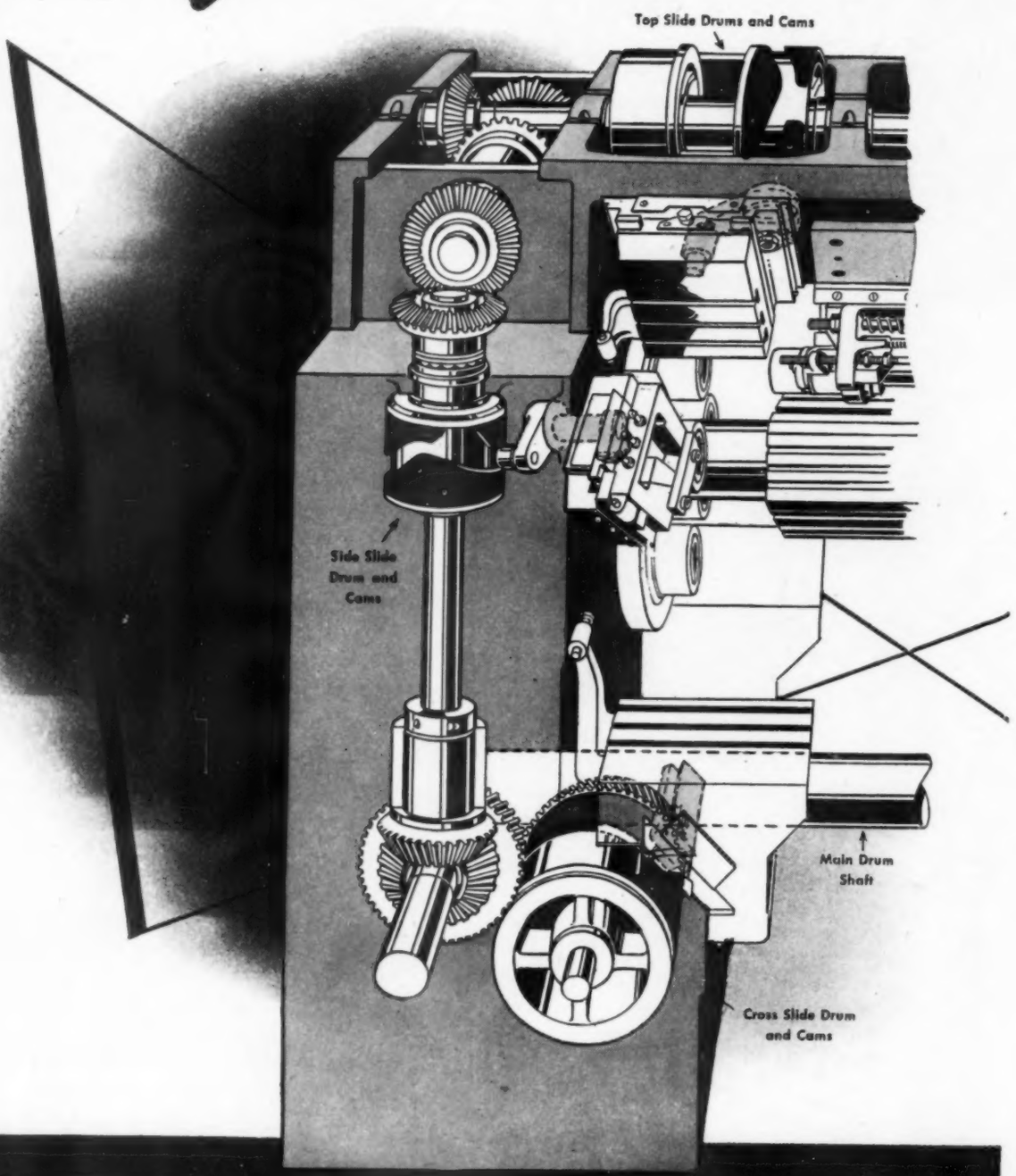
SAVES HEAT—Precipitron-cleaned air is recirculated through the shop, affording considerable savings in normal heating costs. Tests prove that this air is cleaner, and has a smaller oil content than the air in the surrounding shop areas.

*Trade Mark of the Westinghouse Electric Corporation, Reg. U. S. Pat. Off.

Precipitron cleans the air so thoroughly that up to 90% of ALL floating particles as tiny as 1/250,000th of an inch in diameter are removed. It may be installed for both individual and multiple machine tool applications. Our engineers will be glad to tell you more about Precipitron and how it can promote efficiency in your plant. Call your nearest Westinghouse office, or write to: Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.

Westinghouse
Sturtevant
DIVISION

You'll get more good



THE NATIONAL ACME CO.

170 EAST 131st STREET
CLEVELAND 8, OHIO

pieces in the pan with

Model RB Acme-Gridley Bar Automatics

Begin with the right foundation—a heavy, box-type frame—balanced in weight and design to resist vibration at every pressure point.

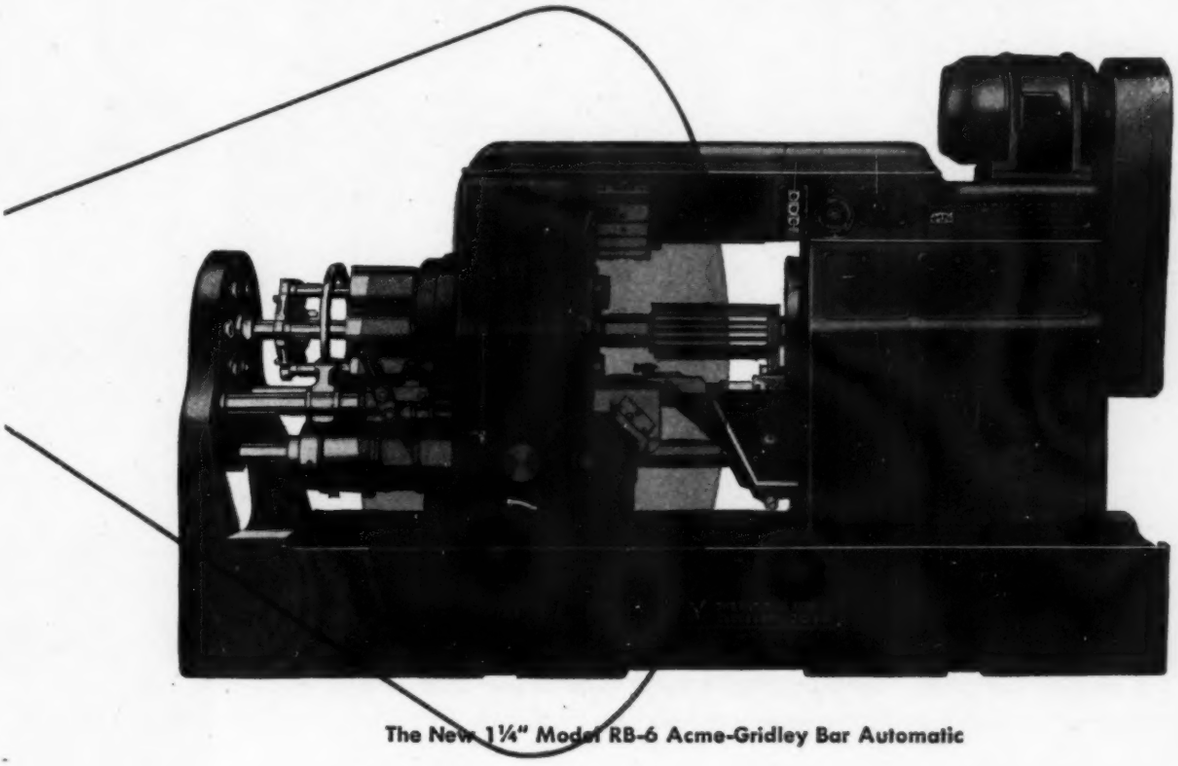
Insist upon positive close-coupled cam and roll contact to the centers of all slides—avoiding toggles, linkages and overhang.

These and other time-proved principles of Acme-Gridley construction are the first requisites of sustained accuracy.

In Acme-Gridley language, "sustained accuracy" also means most *good* pieces in the pan at the end of the day—and years from today.

That's the real pay-off for lowest production costs.

Ask us to tell you how many.



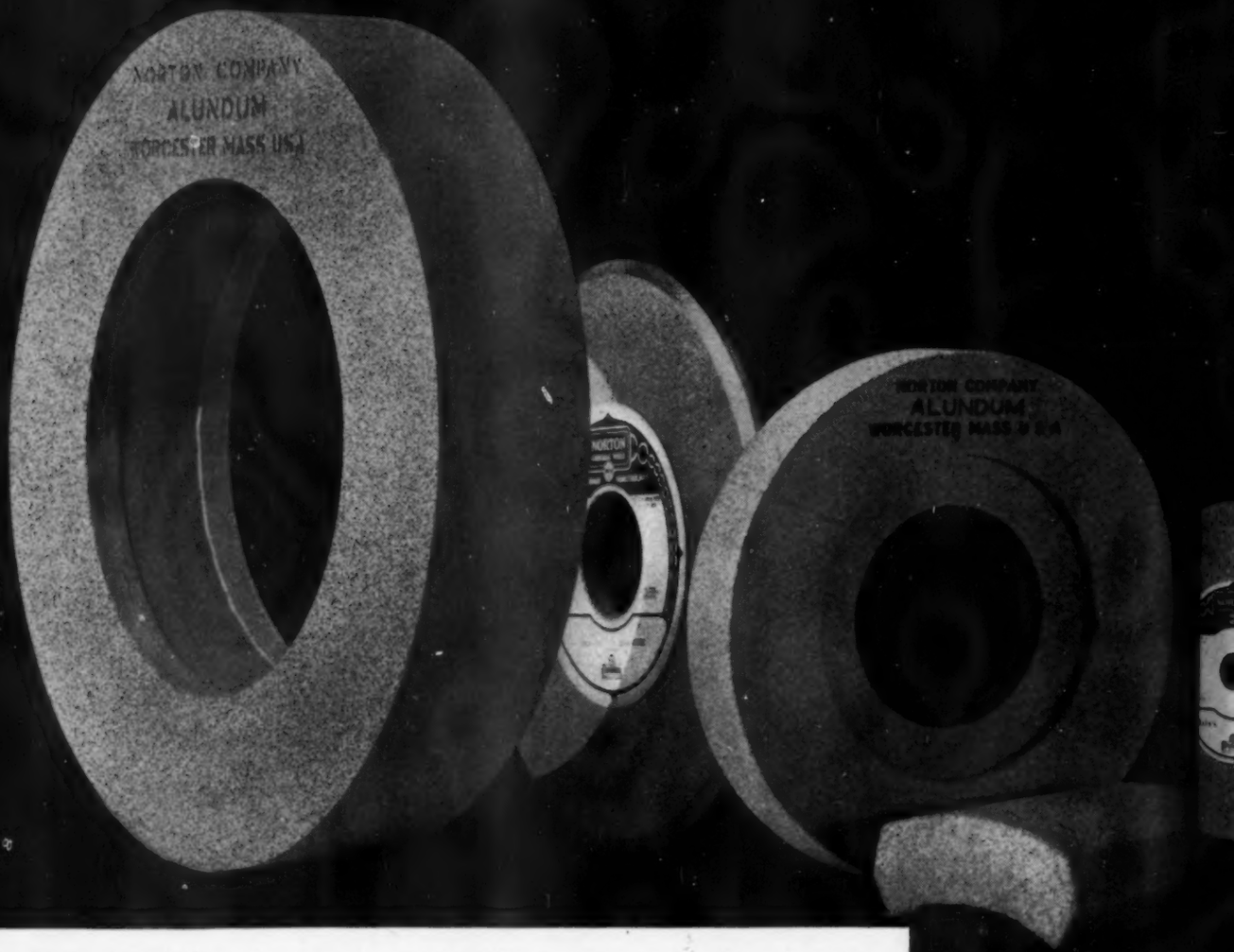
The New 1¼" Model RB-6 Acme-Gridley Bar Automatic

NATIONAL ACME PRODUCTS INCLUDE

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids • Centrifuges • Contract Manufacturing.

These Wheels Can Really

They're Made of the Sensational



32 ALUNDUM abrasive is entirely different from any other abrasive — made differently by a unique Norton-developed process. *There's no crushing to size* — each grain forms in the electric furnace as a single, complete, multi-pointed crystal. The result is a wheel that's *sharper* — that cuts faster and cooler.

And the grains of 32 ALUNDUM abrasive are over 99% pure fused alumina — no non-cutting slag nor pores. This means *greater resistance to dulling* — fewer dressings, longer wheel life.

The Greatest Cost-cutting Development in Abrasives in Over Forty Years

Cut Your Grinding Costs!

32 ALUNDUM®

For Faster Cutting

For Cooler Cutting

For Fewer Dressings

For Longer Wheel Life

The cost-cutting ability of 32 ALUNDUM grinding wheels has now been definitely proved — by over a year of steadily increasing use in thousands of plants. *They can cut costs for you, too.* Try them for cylindrical, centerless, surface, gear, tool and internal grinding. Ask your Norton abrasive engineer or Norton distributor for specific recommendations.

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities

W-1142

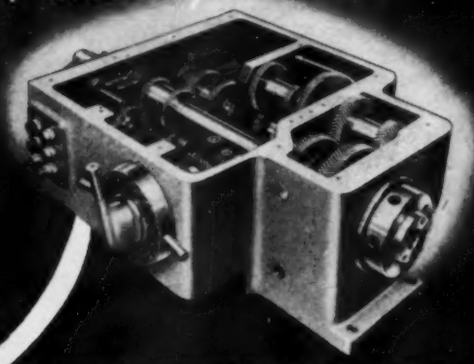
NORTON ABRASIVES

NOT JUST ANOTHER LATHE

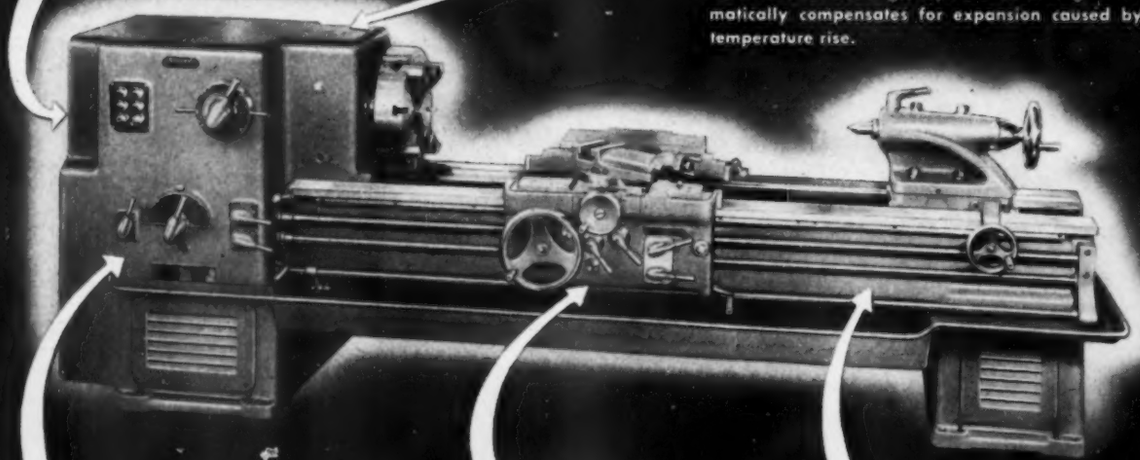
but a Sidney Lathe!

Check these features...

✓ Change gears rotate on anti-friction bearings and are mounted on fixed centers. Driving sheave is mounted on pre-loaded anti-friction bearings and is full floating on sleeve bolted to back of headstock. Drive shaft deflection is thus eliminated.

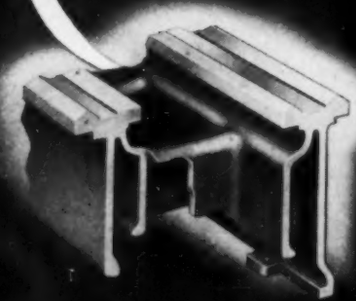


✓ All-herringbone geared headstock provides 32 pre-selective changes of spindle speeds through convenient dial control. Spindle and intermediate shafts are equipped with center bearings in addition to end bearings. Spindle mounting automatically compensates for expansion caused by temperature rise.



✓ Sidney's totally enclosed dial controlled gear box provides 60 changes of threads and feeds. All moving parts run constantly in oil.

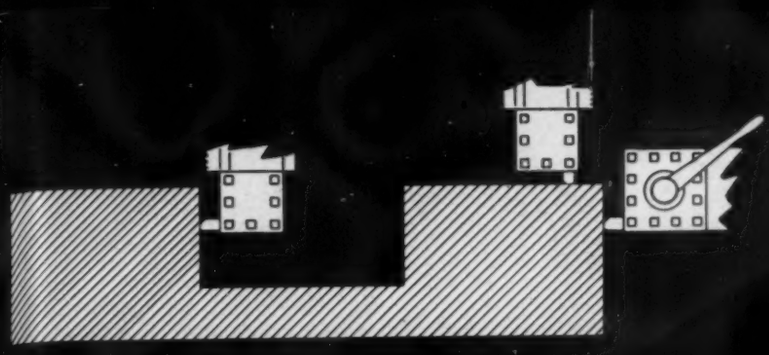
✓ Controls are conveniently located for comfortable operation. Off-set compound—extra large micrometer dials—thumb screw dial lock. Notice also the four swivel hold-down bolts for added rigidity.



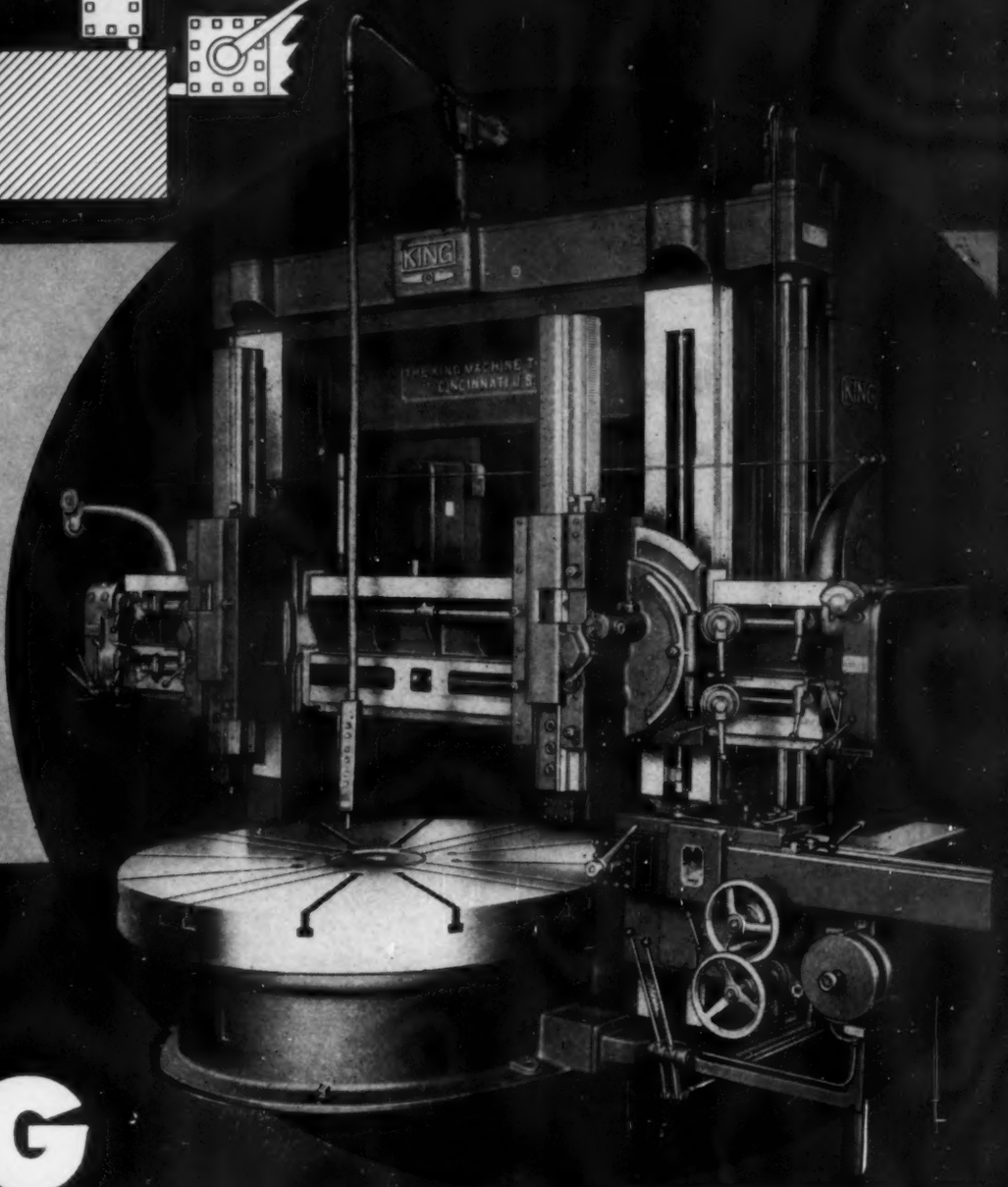
✓ Rigid four-wall bed construction with double cross girts spaced at 12" intervals. Casting is of semi-steel nickel mixture for close grain structure.

SIDNEY MACHINE TOOL COMPANY · SIDNEY, OHIO

Builders of Precision Machinery Since 1904



Boring Facing Turning



on the New Series KING

● Whether your work calls for boring—turning—facing or any combination of these operations, whether it requires the use of carbide tools, whether it's a small or a large job—there's a KING general purpose boring and turning machine that will handle it easier—faster—at lower cost.

Ease of control is evident. Every control lever is located at the front of the machine so that operator always has his controls within arm's reach whether he is changing feeds, table speeds, or making head adjustments.

A substantial increase in weight plus the new massive, rectangular type ram heads gives you the rigidity required for the successful use of carbide tools. Four tapered gibs and eight bearing surfaces provide adjustment for wear and assure continued accuracy.

King Vertical Boring and Turning Machines are available in ten sizes: Single Column—30", 36", 42". Double Column—52", 62", 72", 84", 100", 120" and 144".

THE KING MACHINE TOOL COMPANY

CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines and Sebastian Lathes

now!

a simple a-c with 3 to 1 speed

TRI CLAD
REG. U.S. PAT. OFF.

Type ACA adjustable-speed induction motor

GENERAL ELECTRIC

110-292

motor

range

HERE'S WHERE TO USE IT!

Textile
Slashers
Knitting machines
Individual finishing machines
Spinning frames
Printing machines

Chemical
Shakers
Grinders
Pulverizers
Mixers
Liquid pumps
Solids pumps

Metal-Working
Drawbenches
Lathes
Stamping presses
Milling machines
Grinders

Printing
Job presses
Coating machines
Trimming machines
Stitching machines
Rotary web presses

Food
Ovens
Proofers
Mixers
Fillers
Labelers
Grinders
Centrifugals
Conveyors
Shaker Screens
Pumps
Blanchers

Paper
Winders
Slitters
Supercalenders
Coating machines
Waxing machines
Embossers
Other converting machinery
Stock preparation machinery
Conveyors

Non-Ferrous & Rock Products
Mill feeder drives
Crusher feeder drives
Sinter conveyors
Other conveyors

Yes – you can now get a simple a-c motor and stepless speed adjustment over a 3 to 1 range *in a single, compact enclosure!* At the twist of a dial, the new Tri-Clad Type ACA induction motor changes speed quickly and accurately without *any power converting equipment.* Practically no different looking than any other induction motor, the Type ACA is a simple, economical way to equip old and new machines with an adjustable-speed drive and still retain the advantages of a-c motor operation.

Constant torque at any speed!

This new Tri-Clad motor provides constant torque over the entire 3 to 1 speed range and *holds* its speed despite load changes. Its efficiency and power factor are high at any speed – an important advantage where long operation over most of the speed range is customary. And for EXTRA PROTECTION against physical damage, electrical breakdown, and operating wear and tear, it features sturdy Tri-Clad design and construction.

Up to 50 hp available!

The Tri-Clad Type ACA induction motor with 3 to 1 speed adjustment is now available in ratings from 3 to 50 hp. Standard NEMA dimensions are used. For remote control, a flexible cable or pilot motor are available. Write today for Bulletin GEA-4883. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

You can't beat Tri-Clad Extra Protection!

GENERAL ELECTRIC COMPANY, Section 750-292
Apparatus Department, Schenectady 5, N. Y.

Please send me Bulletin GEA-4883 which describes the new Tri-Clad Type ACA motor:

NAME_____

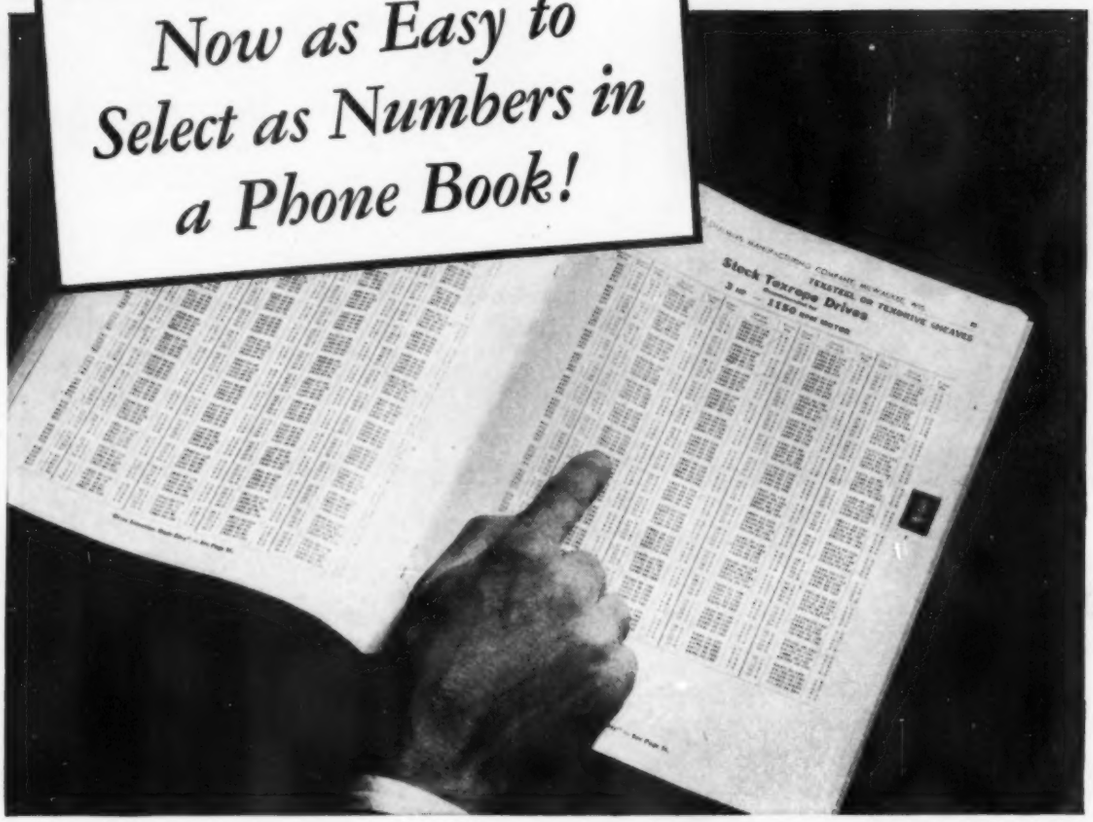
COMPANY_____

ADDRESS_____

CITY_____ STATE_____

ECONOMICAL
Pre-Engineered
TEXROPE V-BELT DRIVES

Now as Easy to Select as Numbers in a Phone Book!



This New Manual is the most complete, most usable V-belt drive engineering handbook ever compiled.

It puts at your fingertips *all* the information you need to solve any V-belt drive problem — quickly, correctly. It contains:

Pre-Engineered Stock Drives from 1 to 150 hp, that solve 90% of all applications. Edge-indexed for quick reference — turn to the page, read off the one BEST drive for your needs.

Engineering Tables . . . drive selections . . . sheave dimensions . . . general information . . . conveniently arranged for easy use in figuring any *special* drives not covered in Pre-Engineered drive tables.

Only Allis-Chalmers, originator of the multiple V-belt drive, can offer you such a book. It's the result of 23 years of industrial V-belt drive experience, and the greatest engineering talent in the business!

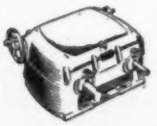
Copies have been mailed to many Texrope users. If you do not have a copy, write for Texbook No. 20P40. A 2336

TEXROPE .. Greatest Name in V-Belt Drives

"Super 7" V-BELTS
Five Types — Sizes to suit every power transmission job.

Texsteel, Texdrive, "Magic-Grip"
— sheaves in a full range of sizes, grooves.

"Vari-Pitch" SHEAVES
Exact variations in speed, stationery or motion control.



SPEED CHANGERS
Speed variations up to 375% at the turn of a crank.

ENGINEERING
Finest V-Belt engineering talent in the world—at your call.

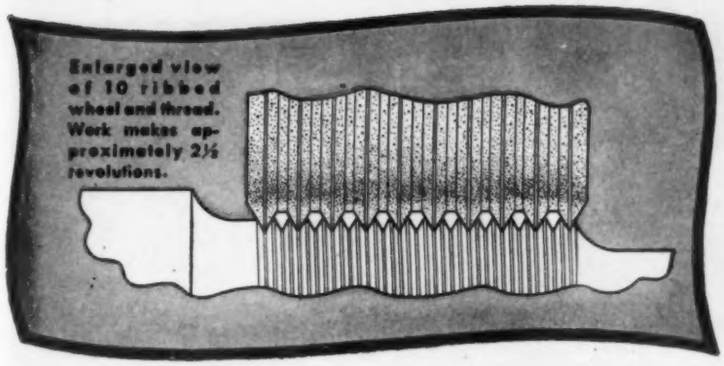
TEXROPE "Super 7" V-Belts result from the cooperative research of two great companies — Allis-Chalmers and B. F. Goodrich. They are sold only by A-C.

Texrope, Super-7, Texsteel, Texdrive, Magic-Grip and Vari-Pitch are Allis-Chalmers Trademarks

ALLIS·CHALMERS

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

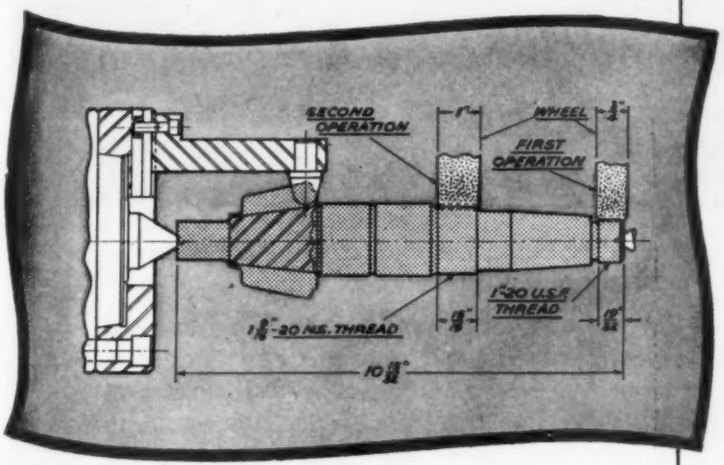
One of the Big 3 in Electric Power Equipment — Biggest of All in Range of Industrial Products



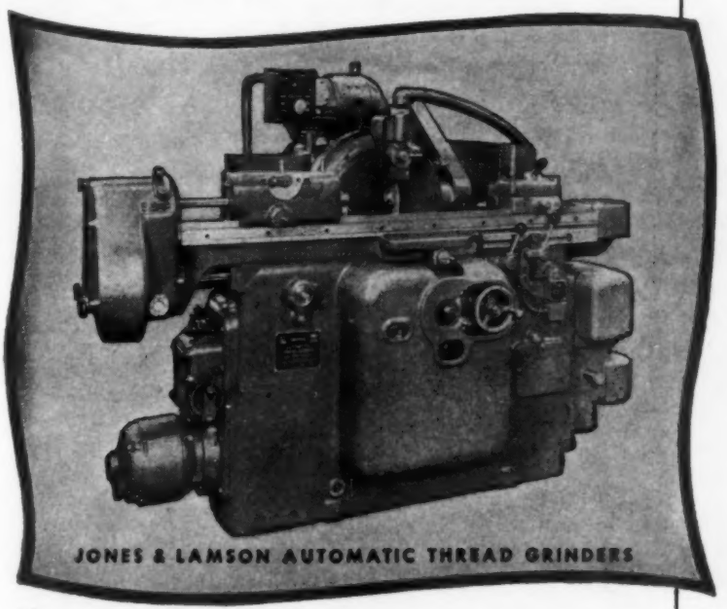
HERE'S *Production* THREAD GRINDING . . .

Ground from the Solid in *15 seconds*

1"—20 N.S. THREAD, GROUND FROM THE SOLID



ON AXLE DRIVE PINIONS



"PRODUCES NEAR PERFECT THREAD"

"EXPENSIVE HAND DIE OPERATIONS ELIMINATED"

"NO MARRED THREADS ON THE ASSEMBLY LINE"

"WHEEL COST PER PIECE LESS THAN THREAD HOB AND CHASER COST"

The Timken Detroit Axle Company, prominent manufacturer of heavy truck axles, has this to say about a Jones & Lamson Automatic Multi-Ribbed Thread Grinder installed to grind the threads on axle drive pinions.

"The threads are machined as a last operation following heat treat and grinding of all bearing diameters and prior to lapping. The machine produces a near perfect thread and eliminates all expensive hand die operations along the line and overcomes marred thread on the assembly line".

". . . the grinding of threads also reduces direct labor costs and indirect cost of cutting tools and equipment".

Jones & Lamson Automatic Multi-Ribbed Thread Grinders offer remarkable opportunities for economy with better quality in the mass production of threaded parts. Ask for one of our engineers to tell you more about multi-ribbed production thread grinding.

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Manufacturer of *Automatic Thread Grinders* and Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies

Now THAT HANDY *All Purpose* WORK CLAMP IN 2 SIZES

LOCK JAW

Stops

SHIMMYING
BUCKLING
HEAVING
SLIDING
YAWING
CHATTERING

Applied as a three jaw chuck on face plate.

Model A on small toolroom horizontal miller.

Eliminates expensive and cumbersome clamping and bolting operations.

Now the heavier Model B Lock Jaw for large table operations and a brand new Model A for positive clamping on smaller machines with limited table space. The new and lighter clamp has interchangeable jaw faces formed to fit contour of work.

The same positive, powerful two-way locking, sure-grip pressure downwards and sideways. Production departments and toolrooms find them handy time savers on planers, radial drills, shapers, milling machines, surface grinders, boring mills and lathes.

Write for Bulletin 140A and specifications.

RIVETT LATHE & GRINDER, Inc.
BRIGHTON · BOSTON · MASS · U S A

Model B Lock Jaw on horizontal boring mill.

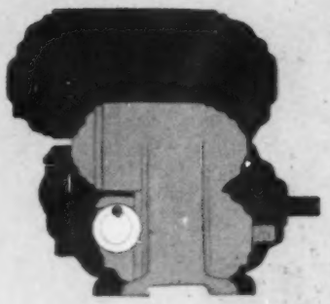
NOW... VARIABLE SPEED... AT ITS BEST!

IMPROVED

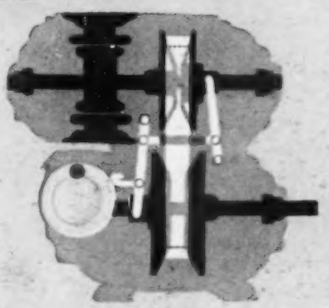
STERLING SPEED-TROL

... PERFECT "SPEED CONTROL" IN ONE COMPACT POWER UNIT

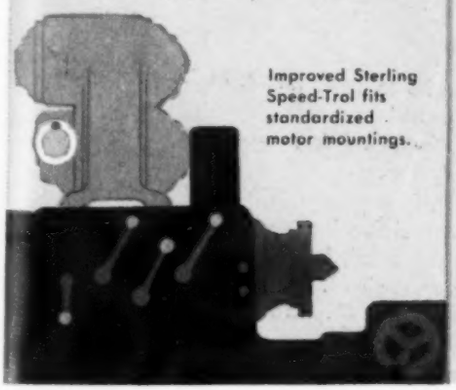
Fingertip speed control provides flexible, positive power at the correct speed — faster or slower. Thousands of satisfied users are getting maximum production efficiency under variable conditions with Sterling Speed-Trols.



Improved Sterling Speed-Trol occupies one-half the space formerly required.



Improved Sterling Speed-Trol is the simplest speed control power unit you can buy — accepted V-Belt principle.



Improved Sterling Speed-Trol fits standardized motor mountings.

The improved Sterling Speed-Trol is rugged, sturdy, and of balanced design for every horsepower rating. Motor and speed control in one compact, integral unit. Generous capacity — liberal ball bearings — experienced engineering insure long, dependable service. Available in a wide range of speed combinations.

★

Use the improved Sterling Slo-Speed geared motor — where one best constant slow speed is required.

Use the improved Sterling Klosd general-purpose motor — where one best constant normal speed is required.

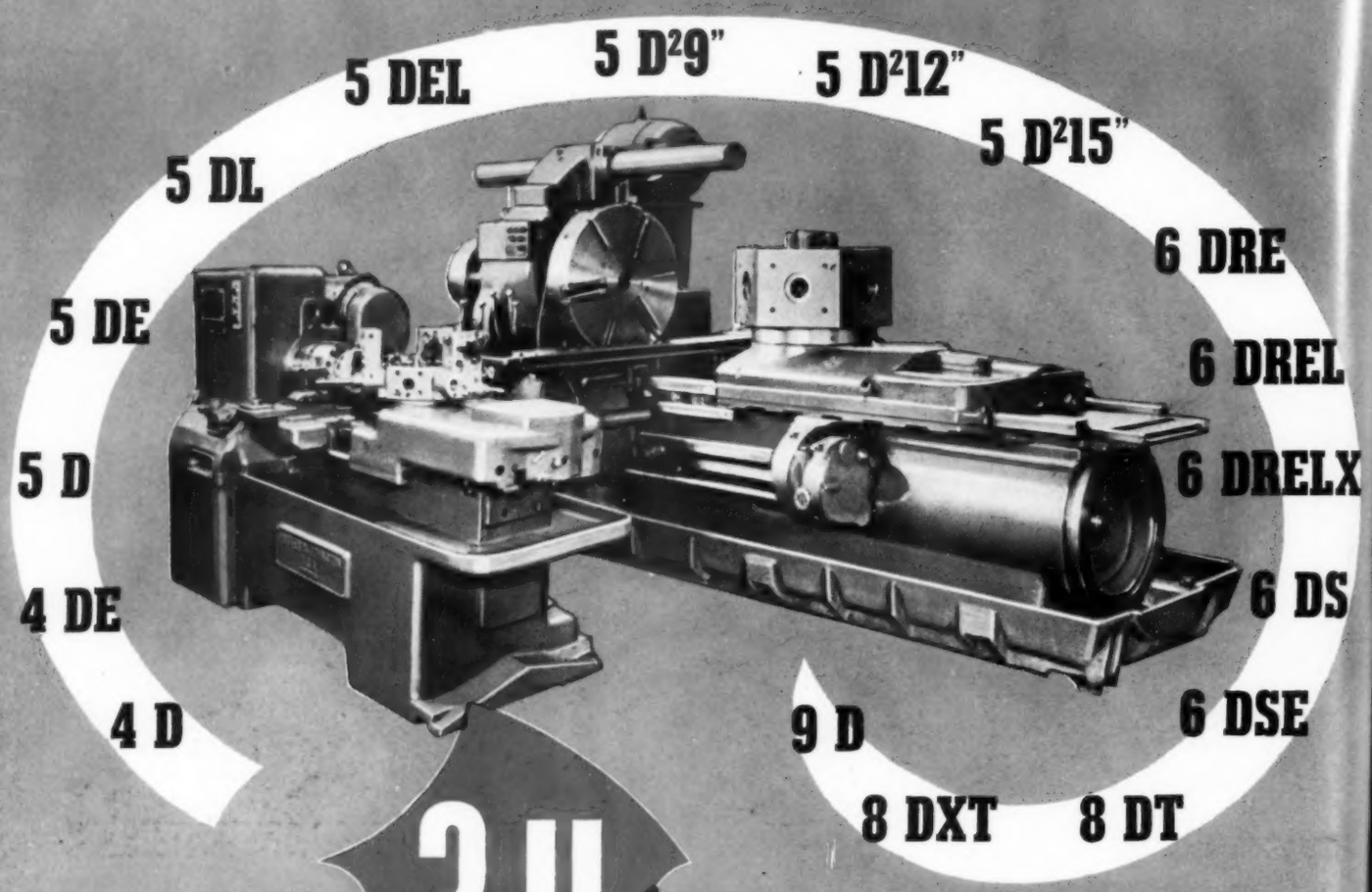
STERLING ELECTRIC MOTORS

GENERAL OFFICES: LOS ANGELES 22, CALIFORNIA

New York 1 • Chicago 6 • Detroit 2 • Boston 35 • Philadelphia 7 • Cincinnati 2
St. Louis 8 • Atlanta 3 • New Orleans 13 • Dallas 1 • San Francisco 5 • Seattle 4

Representatives in Principal Cities and Foreign Countries

P & J Rounds out its Comprehensive Line



WITH THE NEW 3U Speed-Flex AUTOMATIC TURRET LATHE

MODERN, FAST ACCURATE *specially designed for small work*

The P&J 3U Speed-Flex Automatic Turret Lathe is NEW from the ground up . . . not the adaptation of a larger machine. While it is the smallest machine in the P&J's broad line, it incorporates the basic features of design which have long since been responsible for the outstanding performance of all Potter & Johnston Chucking Machines.

With the advent of the Model 3U Speed-Flex, a machine is available which is exactly fitted to the machining of small work, yet all flexibility in tooling, inherent in the entire P&J line, is retained. When retooling is necessary it can be handled effectively and economically. Thus this new member of the P&J family will prove a sound investment on the wide range of small work which falls within its capacity.

This new machine assures highest output per spindle and lowest production cost per operator.

Condensed Specifications

Capacity: Castings and Forgings up to 6" diam. and 4" in length.
Spindle Speeds: 73 to 1445 R.P.M. standard; dual range 36 to 711 R.P.M. and 73 to 1445 R.P.M. optional.
Swing over Cross Slide: 8¾".
Chuck Equipment: 8" diameter (Air operated).
Cross Slide Travel: 2½" each way.
Turret Slide Travel: 6".
Spindle: high carbon steel forging.
Gears: chrome vanadium steel, heat treated and shaved.
Bearings: anti-friction throughout.
Control of Speed and Feed: Electro-Pneumatic.
Controls: full electrical.
Weight: 5000# approx.

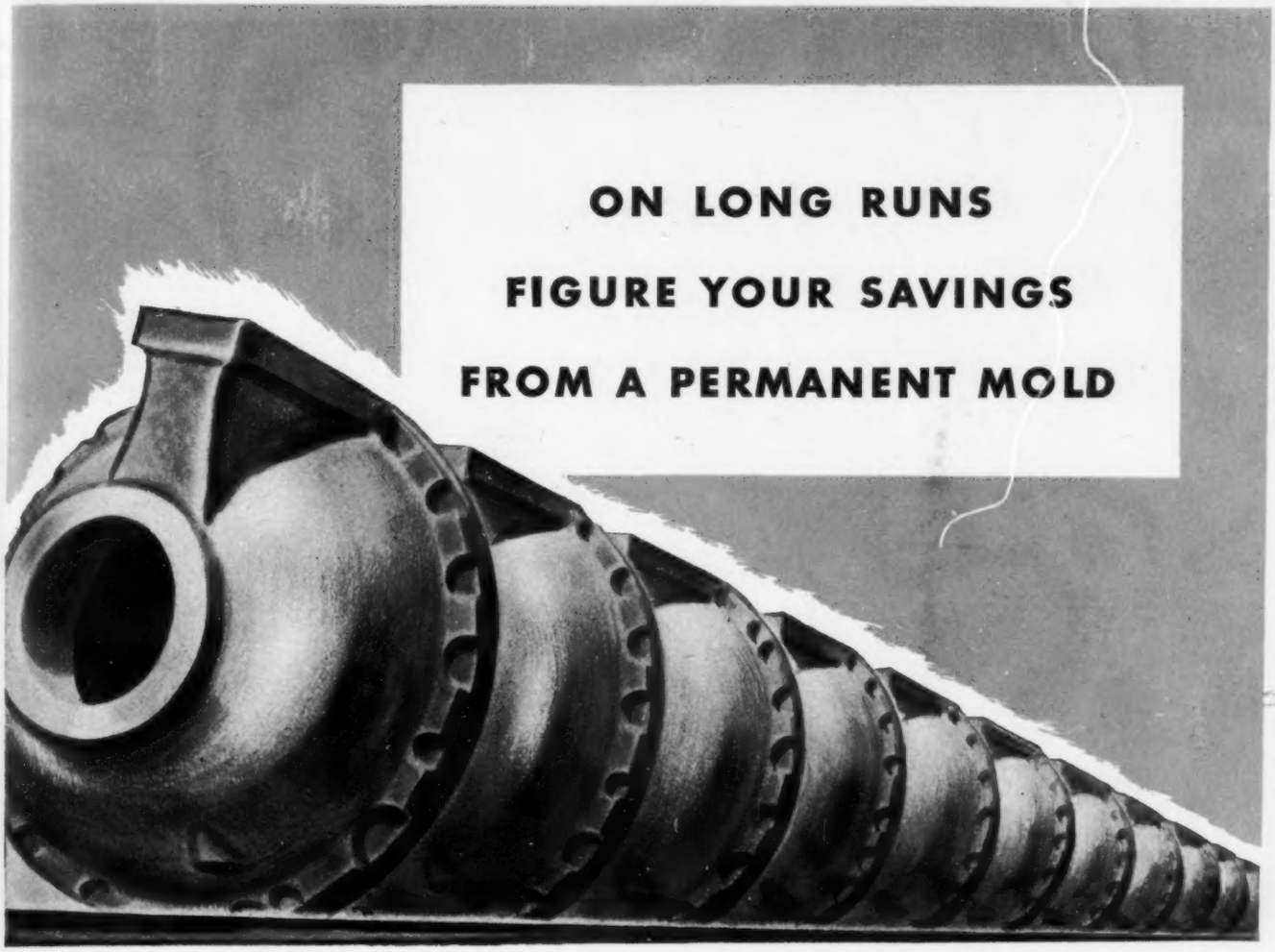
•

Complete details covering the P&J 3U Automatic Turret Lathe are available on request.

POTTER & JOHNSTON MACHINE CO.

Pioneer Manufacturer of Automatic Turret Lathes

PAWTUCKET, RHODE ISLAND



And also figure on a BONUS in lightness!

If your quantities justify it, a permanent mold casting will save you a lot of money in machining costs—rough machining and finish machining.

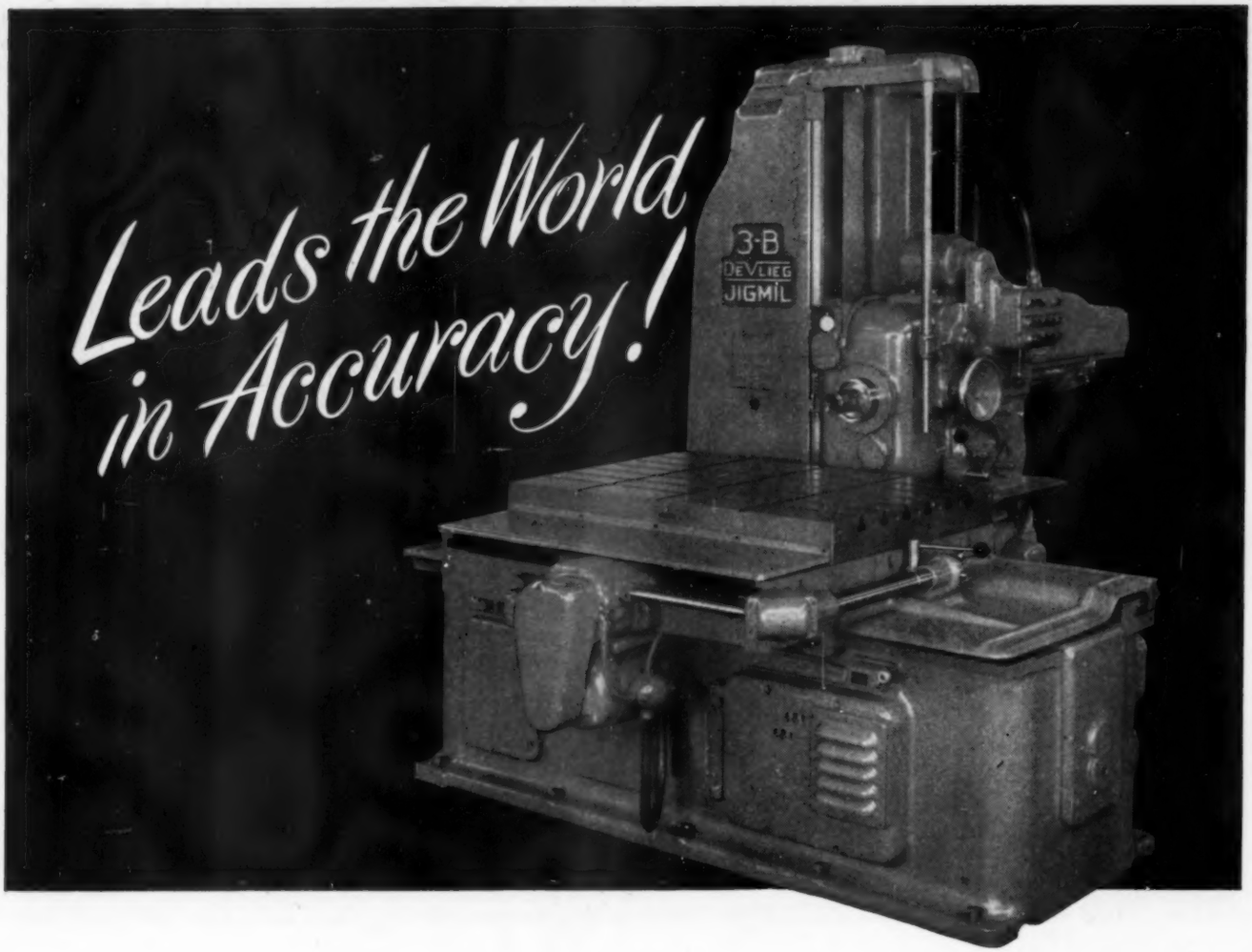
Further—a permanent mold casting of American Magnesium pays off by the elimination of dead weight. Magnesium is 35% lighter than aluminum, 75% lighter than steel.

The double economies of American Magnesium Permanent Mold Castings are something to investigate. You can't lose by looking into it. Many others have found their time well rewarded. The 59 years of light-metal know-how of Aluminum Company of America is ready to help you, too. If you can save—why not? ALUMINUM COMPANY OF AMERICA, sales agent for American Magnesium Products, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

MAGNESIUM MAZLO PRODUCTS
Reg. U. S. Pat. Off.

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA



The DeVlieg JIGMIL is now recognized as The World's Leader in the field of accurate boring, in addition to its unique capacity for high productivity on:

1. **Single part precision boring.**
2. **Tool, jig and die work.**
3. **Repetitive production work without jigs.**

Write today for new descriptive booklet.

DeVLIEG JIGMIL

DeVLIEG MACHINE COMPANY

450 FAIR AVE., FERNDALE 20, (DETROIT) MICH.

BARBER-COLMAN CONVEX CUTTERS MILL FLUTES IN HSS TAPS, 600-800 PIECES PER GANG-SHARPENING, WITH NO BREAKAGE

High Speed Steel is tough to mill, and hard on the life of any cutting tool. Consequently maximum tool life would not ordinarily be expected on this job. Yet these Barber-Colman Standard Convex cutters mill 6 flutes in each of a gang of five High Speed Steel Tap bodies, producing 600-800 bodies per gang sharpening. This is good tool life in any ferrous material.

B-C Cutter Engineers have established tooth designs, methods of heat treating and special cutting clearances which provide fine results on a variety of milling operations. These improvements, built into all Barber-Colman milling cutters, are giving maximum tool performance and less machine downtime. Production costs *can be cut* by using tools which last longer.

PERFORMANCE RECORD:

Operation — Climb Milling Flutes, .1875″ radius.
Material — HSS (18-4-1)
Cutters — B-C Convex Cutters 3-1/4″ x 3/8″ x 1″
Feed — 3.4″/Min. Speed — 100 SFM
Tool Life — 600-800 pieces per gang-sharpening

Write for complete information on Barber-Colman Milling Cutters. Ask for catalog MC12.

MODERN MACHINES WITH ORDINARY CUTTING TOOLS ARE NOT FULLY EFFICIENT

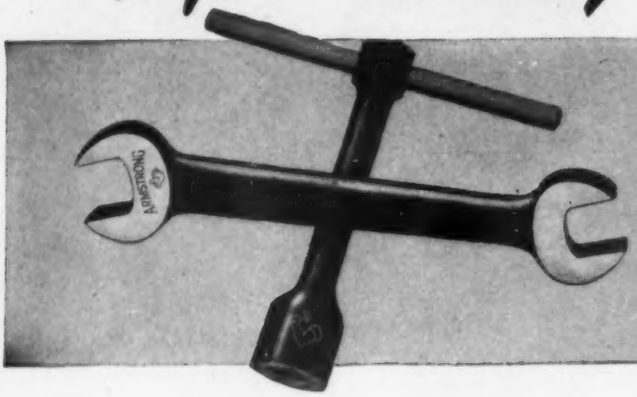
BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST. ROCKFORD, ILLINOIS U.S.A.

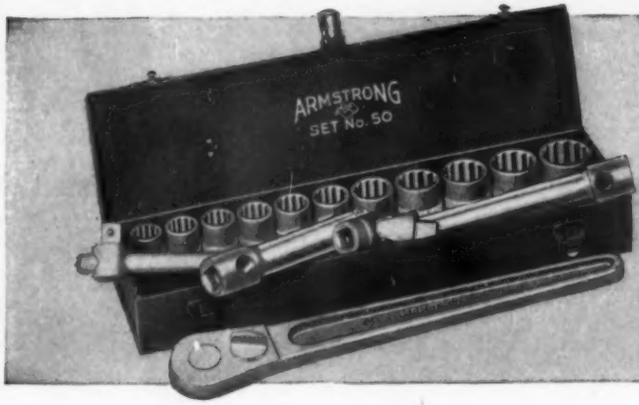
ARMSTRONG

Top Quality WRENCHES



Armstrong Drop Forged Carbon Steel Wrenches including 19 Different Types.

Armstrong Drop Forged Alloy Steel Wrenches including 12 different types.



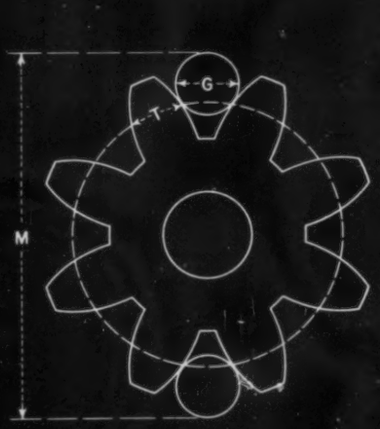
Armstrong Alloy Steel Detachable socket wrenches and driving units . . . a complete assortment of sets.

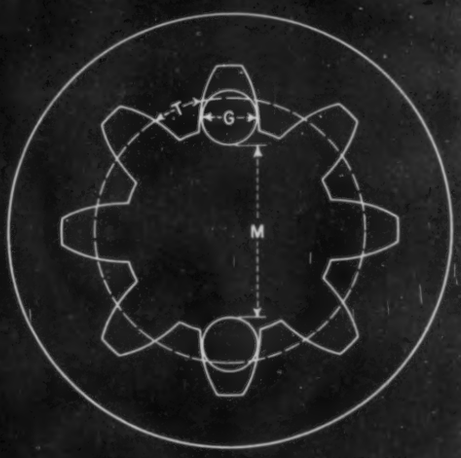
For Construction, Armstrong Drop Forged Ratchets. Construction and Structural wrenches in both Carbon and Alloy.

ARMSTRONG BROS. TOOL CO.

315 N. Francisco Ave. Chicago 12, U. S. A.
Eastern Whse. and Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. and Sales Office: Mission St., San Francisco 3, Calif.

Van Keuren





EXTERNAL SPUR GEAR **INTERNAL SPUR GEAR**

SIMPLE . . . The only calculation required is one of simple division.

RELIABLE . . . The system is favored by outstanding American Gear Manufacturers.

ACCURATE . . . The Van Keuren Gear Tables are complete for gears from 5 to 500 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. If the measurement over the wires is greater than the value calculated from the tables, the tooth is too thick and cutter must be fed further into the gear blank. Exact constants for controlling tooth thickness and backlash to .0001" are given for all pressure angles.

ULTIMATE ACCURACY

Catalog No. 33 is a manual of precision measuring systems, giving complete tables and simplified formulas for measuring standard and special threads, splines, spur gears, helical gears and worms. Send for Catalog 33.

MEMBER OF AGMA

Van Keuren

28th YEAR

1947

ANOTHER EXCLUSIVE HYPRO FEATURE

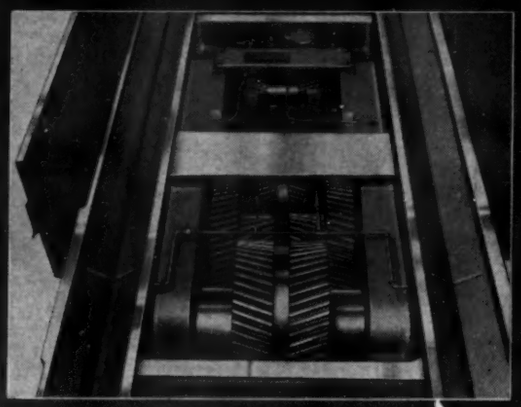
Complete Herringbone Twin Gear Table Drive

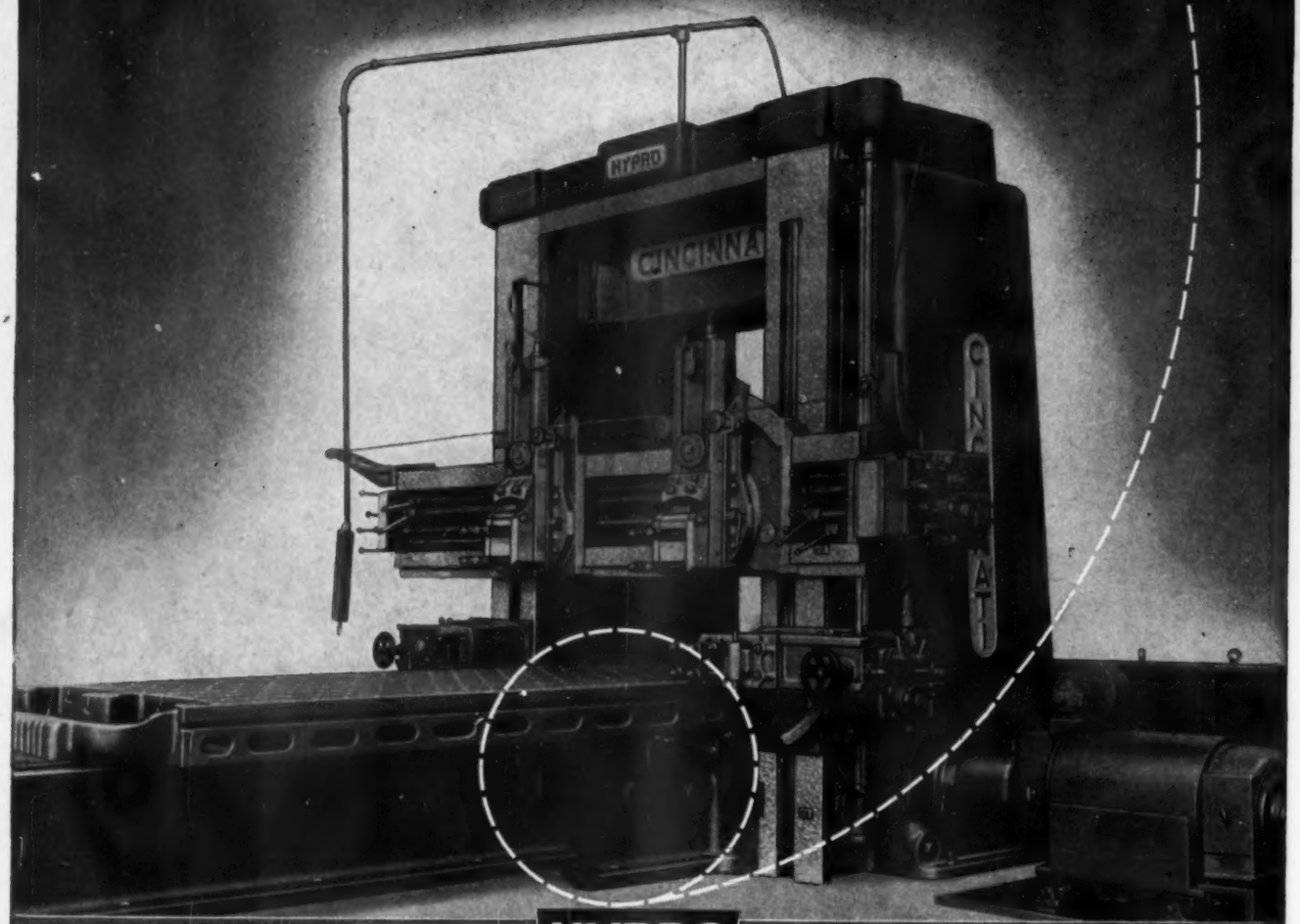
In no other planer will you find the complete steel herringbone twin gear table drive.

The twin gear train, including the bull wheel and rack, is of the herringbone type. This construction gives a smooth, continuous and even flow of power through greater tooth surface and eliminates side thrust.

There is no shock when the load is transferred from tooth to tooth, eliminating practically all wear. The gears work silently and without vibration on their large diameter shafts which are hardened full length and ground at the journals. All gears and pinions are made of steel and flame hardened.

This is one of those exclusive features that make the Cincinnati Hypro a buyer's choice.

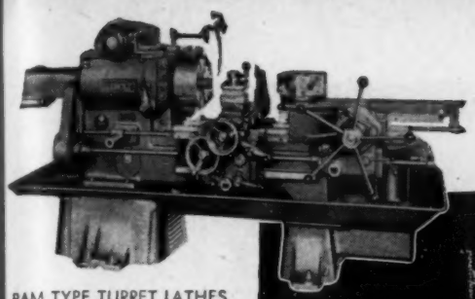




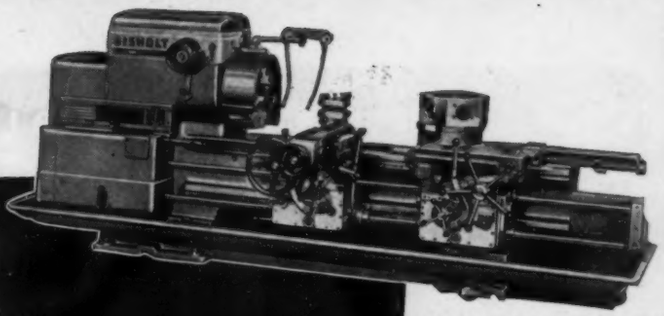
THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO



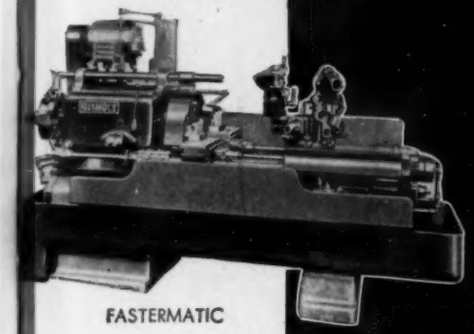
RAM TYPE TURRET LATHES



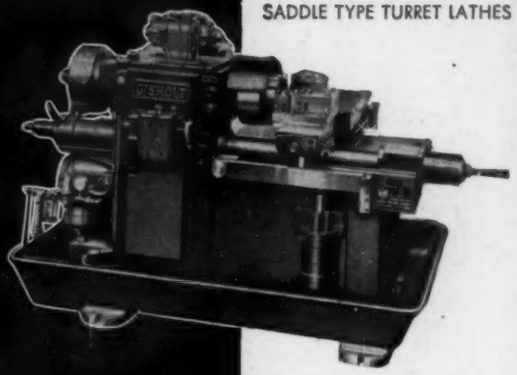
SADDLE TYPE TURRET LATHES

Which

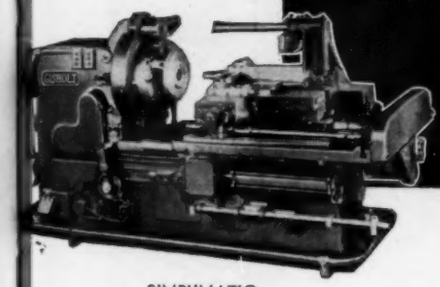
GISHOLT MACHINE for your Round Parts?



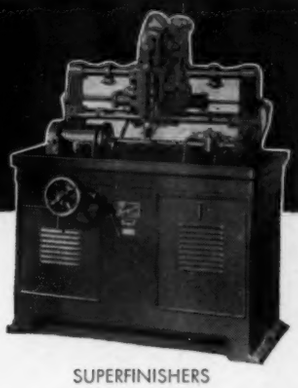
FASTERMATIC



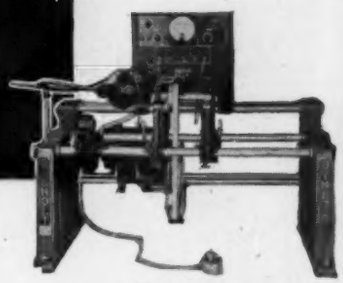
HYDRAULIC AUTOMATIC LATHES



SIMPLIMATIC



SUPERFINISHERS



BALANCERS

If you're machining—or surface finishing—or balancing parts that are round, or partly round, the chances are that Gisholt can help you cut your costs.

It doesn't matter whether your parts are big or little—whether your volumes are large or small—Gisholt offers the right size and type of machine to answer your needs.

Meet us at the GISHOLT ROUND TABLE

Here at Gisholt you will find an organization that has specialized for over a half century on the production and refinement of round and partly round parts. Here is a group of specialists who can bring more experience to bear on your particular production problems. The Gisholt Round Table is a clearinghouse for practical ideas. Make use of it.

GISHOLT MACHINE COMPANY

Madison 3, Wisconsin

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.

Look Ahead... Keep Ahead... With Gisholt

URRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

WHICH IS BETTER FOR YOU, HACK SAWS OR BAND SAWS?

Reading Chain & Block Corporation found the answer by contacting the MARVEL field engineer. Only a MARVEL engineer could analyze this problem without bias because only MARVEL makes both hack saws and band saws. As a result, Reading bought three different types to most efficiently handle their metal sawing. A No. 6A machine for production cutting of identical pieces, a No. 4B machine for fast, accurate, miscellaneous cutting, and a No. 8 band saw machine for cutting of structurals, mitering, and other miscellaneous work.

Whatever your metal sawing problem, there is among MARVEL'S 11 different series of sawing machines, a saw or saws that will exactly meet your needs. Your local MARVEL Engineer will gladly study your sawing problems, make recommendations and quote prices.

No. 8 MARVEL Metal Cutting Band Saw. This most versatile saw takes work up to 18" x 18", mortises, miters or roughs to shape.

No. 9A MARVEL Production Saw (world's fastest) automatically feeds, measures and cuts off identical pieces from nested or single bars up to 10" x 10" cross section.

No. 4B MARVEL Hign Speed Saw is a moderate priced, very fast 6" x 6" capacity saw. Here it ideally meets the requirements of the maintenance department.

READING CHAIN and BLOCK CORPORATION

TELEPHONE 4-8558

Manufacturers
Materials Handling Equipment
CHAIN HOISTS - ELECTRIC HOISTS - TRAVELING CRANES - MONORAIL SYSTEMS

GENERAL OFFICES
READING, PA., U.S.A.

October 24, 1947

Armstrong-Blum Mfg.Company
5700 West Bloomingdale Avenue
Chicago, 39, Illinois

Gentlemen:

We have in our shop three Marvel Saws which are used all day in production work for the cutting of materials in connection with the manufacture of hoists and cranes. Since these three saws have been used in our plant the cost of cutting materials has been greatly reduced, and the speed at which the materials are cut has been increased to such a point that we no longer have "lay overs" due to the lack of materials.

We wish to assure you at this time that when we need more automatic saws in our plant, we will definitely give you first consideration to install the Marvel Saws in our plant.

Whenever it has been necessary for any repair service, or engineering service, to be applied to these saws, we have never had to wait or inquire the second time for these services. That is one thing that has kept us in production to this date.

Again assuring you that your services and attentions to our requirements have been very satisfactory, we remain,

Very truly yours,

READING CHAIN & BLOCK CORP.

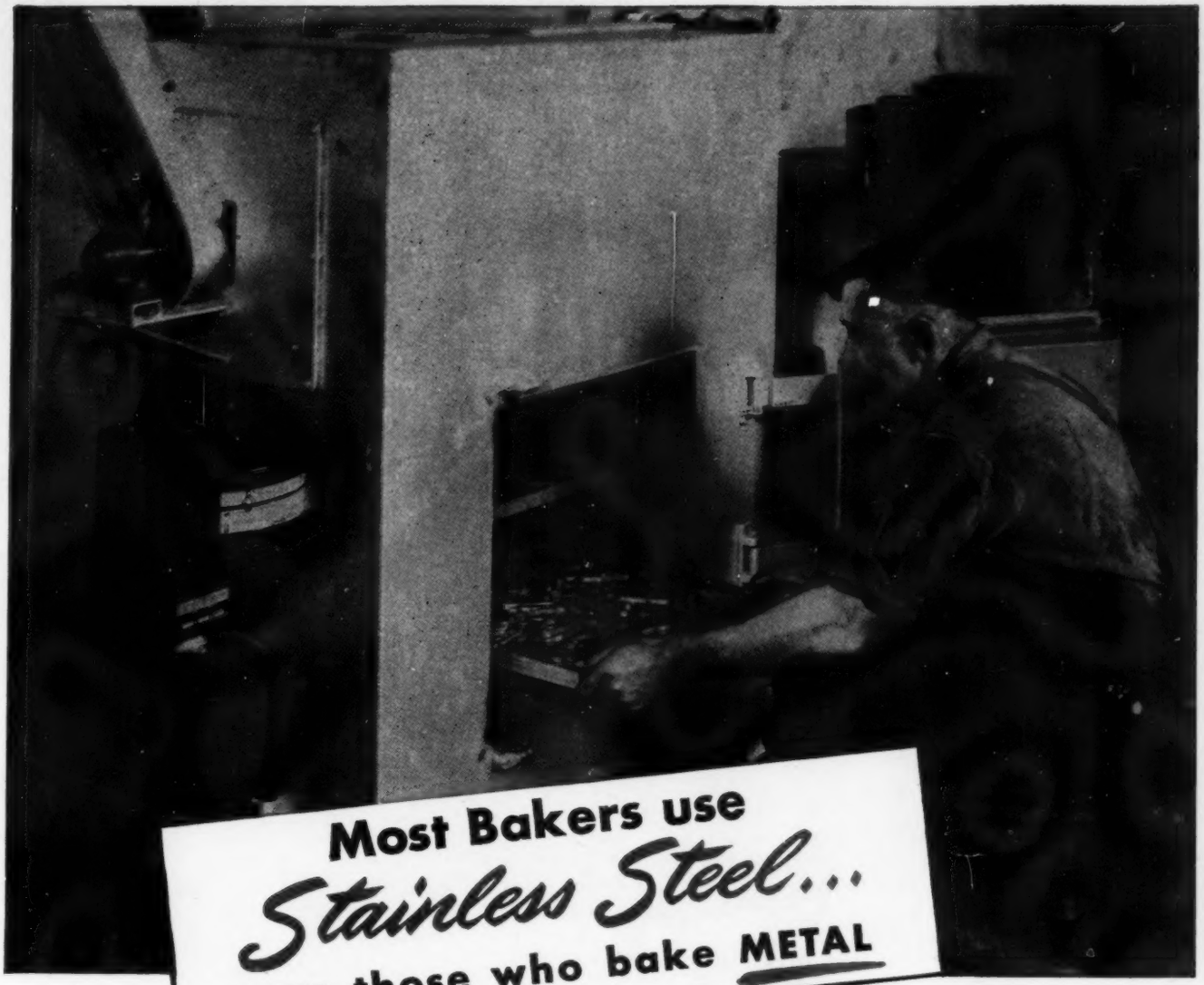
Fred M. Howard

Fred M. Howard
Purchasing Agent

F:H:akh

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave. Chicago 39, U.S.A



Most Bakers use *Stainless Steel...* even those who bake METAL

REALLY up-to-date bake-shops are all agleam with shining Allegheny Metal dough mixers, trays, oven linings and trim, etc., primarily because of stainless steel's great resistance to corrosion and wear. That makes it easy to keep sanitary, cuts maintenance and cleaning costs to a whisper, protects product taste and purity.

But in the Allegheny Metal-lined annealing oven above, where tool steel parts are heat-treated, the emphasis is on stainless steel's resistance to oxidation at high temperatures, and its retention of strength. And we've gone much farther along this line to develop the Super High-Temperature Alloys that make possible such marvels as jet engines, gas turbines and the like.

The whole point is that stainless steel is the most tremendously versatile material any manufacturer can hope to find. Allegheny Metal has infinite potentials for improving your equipment or product, and at the same time, your competitive position. *And it's available!* Plan for it, place your order for it *now*—and count on our Technical Staff and Development Engineers to help you realize the fullest advantage from it.

ALLEGHENY LUDLUM STEEL CORPORATION Pittsburgh, Pa.

Pioneer in Specialloy Steels

W&D 1275C

ALLEGHENY METAL is stocked by all JOS. T. RYERSON & SON, INC. Warehouses

Specify MO-MAX
HIGH SPEED STEELS

In circular and flat forming tools, as in all other cutting tools, the toughness and hardness of MO-MAX assure better performance.

Buyer's Guide to Brands of MO-MAX

"LMW"	Allegheny Ludlum Steel Corporation
"MCHIGAN"	Atlas Steels Limited
"BETHLEHEM HM"	Bethlehem Steel Company
"MO-CUT"	Braeburn Alloy Steel Corporation
"STAR MAX"	Carpenter Steel Company
"MOLITE M-1"	Columbia Tool Steel Company
"REX T-MO"	Crucible Steel Company of America
"DI-MOL"	Henry Disston & Sons, Inc.
"HI-MO"	Firth-Sterling Steel Company
"REX T-MO"	Halcomb Steel Company
"MOGUL"	Jessop Steel Company
"LATMO"	Latrobe Electric Steel Company
"MIDMAX"	The Midvale Company
"S. T. M."	Simonds Saw & Steel Company
"MO-TUNG"	Universal-Cyclops Steel Corporation
"V-N-2"	Vanadium-Alloys Steel Company
"VUL-MO"	Vulcan Crucible Steel Company

Only MO-MAX GIVES YOU *ALL* THESE ADVANTAGES

1. MO-MAX has superior cutting qualities.
2. The machinability of MO-MAX is unexcelled.
3. MO-MAX is economical. Its specific gravity is about 8% less than that of 18% tungsten steel.
4. MO-MAX is available in a standardized composition; also in cobalt and high vanadium varieties for special high speed steel requirements.
5. For 14 years MO-MAX has demonstrated its superiority in all types of cutting tools.

Learn all the facts! **Send for your copy of the MO-MAX Handbook, sixth edition. Get the full story about this remarkable steel, including easy-to-follow instructions on heat treating.**

THE CLEVELAND TWIST DRILL COMPANY

1244 East 49th Street • Cleveland 14, Ohio

. . . and covers them BETTER!

YES, Cimcool covers 85% of all metal working operations—replaces all water emulsions and all but a few highly compounded specialty oils. But that's only half of the story. Cimcool actually does a *better* job—reduces costs—improves results—because it's an entirely *new kind* of cutting fluid. It's a *chemical emulsion,* incorporating an entirely new principle in cutting fluids—combining friction reduction and cooling capacity in a degree never before attained. Plant after plant knows these statements are facts, not claims. Give it a test and see for yourself!

Here's HOW Cimcool does it better!

- Cimcool cools faster--allows faster cutting.
- Uniform work temperature increases accuracy.
- Chemical lubricity increases tool life.
- No fire hazard—no smoke—no slippery film.
- Non-irritating—not subject to rancidity.
- Contains a long lasting rust inhibitor.

CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID

Trade Mark Reg. U. S. Pat. Off.

CIMCOOL DIVISION of THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.

fast operator (Quick Exchange)

WHEN the tool room is flooded with calls for the fast production of odd lots of work, you need an internal grinder that's a fast operator —one that can be set up easily and changed over quickly. You need a Bryant No. 112 Internal Grinder.

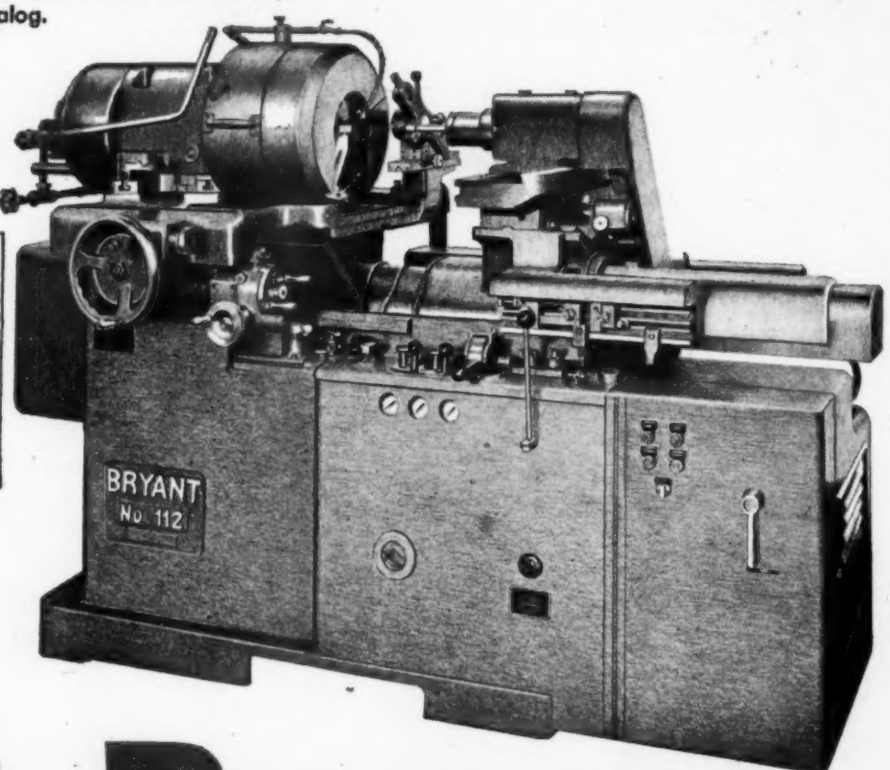
Quickly adjusted cycle controls for wheelslide—Selection of cycle phases either manually or automatically through main wheelslide control. Independent setting of wheelslide traverse for wheel dressing and grinding by two convenient hand throttles. Universal stop rod positions wheelslide for face grinding. Positive locking reversing dogs for setting grinding stroke quickly. Belt driven wheelheads; Hi-Frequency wheelheads for speeds up to 100,000 R.P.M.

Work spindle designed for operating efficiency—Rigid setting for taper grinding up to 90° included angle, provided by double circular slide mounting. Infinite spindle speeds from 100 to 1000 R.P.M. Quick interchange of chucks, holding fixtures and face plates provided by American Standard Type Cam Lock Spindle Nose.

Three cross-feed controls for versatility—Fast set-up provided by rapid traverse cross-feed. Increased output on long runs with power cross-feed control. Accurate size control through precision feed dial. These are the highlights that make set-up of the 112 simple and change-over fast. When combined with the basic features available in all Bryant grinders, they add up to less down time, more accurate work, finer work finish and faster production.

For more details on a fast operator that can handle more calls per day, just ask for the Bryant No. 112 catalog.

No. 112
HYDRAULIC
INTERNAL GRINDER



Send for the Man from

BRYANT CHUCKING GRINDER CO.

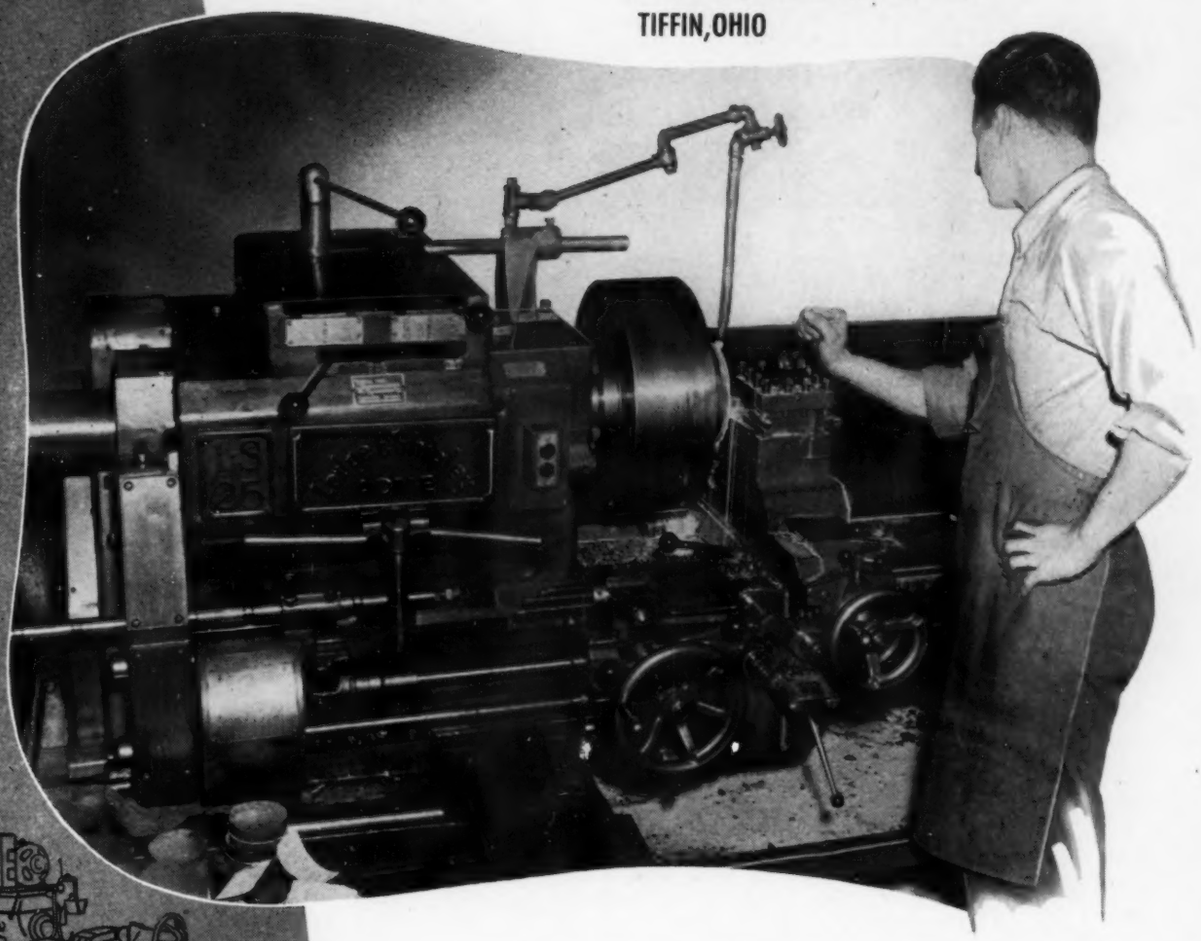
SPRINGFIELD, VERMONT, U. S. A.

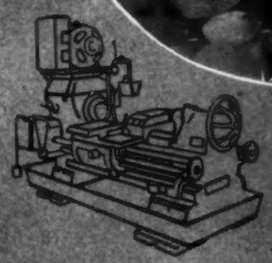
BRYANT

Lodge & Shipley
ACME
TURRET LATHES

"First class machines in every respect giving highly satisfactory results"

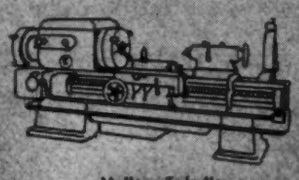
THE NATIONAL MACHINERY CO.
TIFFIN, OHIO





2A and 3A Duomatic (automatic) Lathes

Engine, Tool Room and Manufacturing Lathes



Hollow Spindle Lathes

Here is another machinery manufacturer . . . a firm that makes and knows fine machinery . . . using Lodge & Shipley ACME Turret Lathes with satisfaction and confidence. The National Machinery Co., makes forging machines, and bolt, nut, rivet and wire nail machinery in more than two hundred sizes and types.

The widely varied operations performed on Lodge & Shipley ACME Turret Lathes at National Machinery includes: production of cap screws from hex stock, the making of end plates for cam shafts (illustrated above), and axles, shafts, and gears. Rigid dimensional requirements are met with ease.

Lodge & Shipley ACME Turret Lathes offer profit making advantages in the country's leading plants. Write for catalogs showing the complete line.

THE **Lodge & Shipley** COMPANY

MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST
CINCINNATI 25, OHIO

HIGH SPEED
GREAT RIGIDITY
A BEAR FOR PRODUCTION

THE GRAY PLANER *Cub*

PRODUCES BETTER WORK...FASTER

1. The planer for Carbide Tools—cutting and return speeds up to 300′ per minute.
2. Speed of cut and return instantly adjustable from operating position.
3. Table started in either direction, reversed, "inched", or stopped from pendant switch.
4. Single-Shift power rapid traverse controlled at the heads or from either end of rail.
5. Space Saver Drive, with Full Floating drive Shaft.
6. Non-Metallic Table Ways eliminate scoring.
7. Loop Lubrication. The only adequate system for high speed reciprocating tables.
8. Mechanical non-shock tool lifters.
9. Side head feed independent of rail heads.
10. Built in 24″, 30″ and 36″ sizes.

Write for fully illustrated descriptive Bulletin No. 55

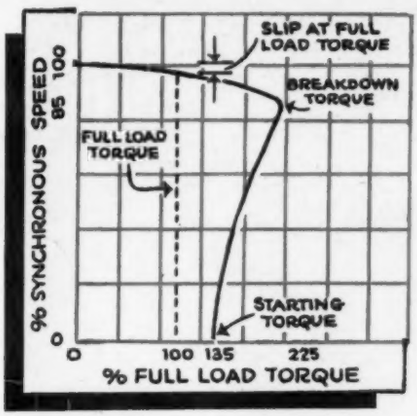
The G.A. **GRAY** *Company*

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

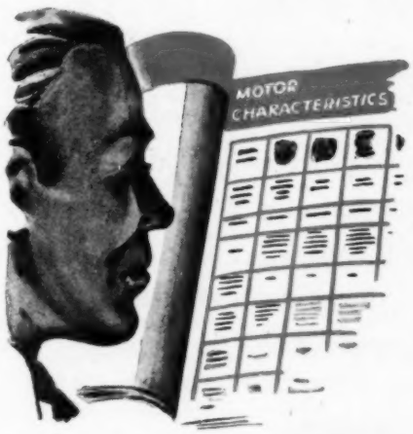
Here's One Way to Choose Motors...



Sure, Your Local "Swami" can pick a motor for you in an instant! But if you want motor counsel you can *bank* on . . . you'll consult a reputable motor manufacturer. In place of crystal-ball gazing, he'll advise you to follow *practical* and *orderly* steps in arriving at *right* motor selection. For example . . .

First, Study Your Power Supply . . . voltage, frequency, number of phases; the p.f. required by your utility. Judicious selection will help balance your motor capacity . . . lower power costs. And check the voltage regulation — choose motors with enough torque to start and carry the load. Next . . .

Study the Driven Machine and surroundings. What hp? What starting torque? Will you need a horizontal or vertical motor — direct-connected, belt-driven or gear-operated? How about surroundings — ambient temperature, moisture, corrosion, dust. Each calls for a particular type of protection. Now . . .



Study Your Motor Characteristics. *A-c motors?* For most jobs they're satisfactory and economical. *D-c motors?* For wide speed range; for fast acceleration or reversal they may prove your best bet. *Synchronous motors?* When applicable they give you low-cost p.f. correction. You're *still* undecided? Call in your nearby Allis-Chalmers motor expert. He'll be glad to help you decide—with recommendations backed by 50 years of motor-building!

Wise Motor Choice Saves Power; Ups Profit!

YES, CRYSTAL-BALL GAZING methods are out when you're trying to get *maximum* return on your electric motor investment. Slip-shod selection usually results in over-capacity, high power and maintenance bills — the kind of costs that in the competitive era of tomorrow you won't be able to afford!

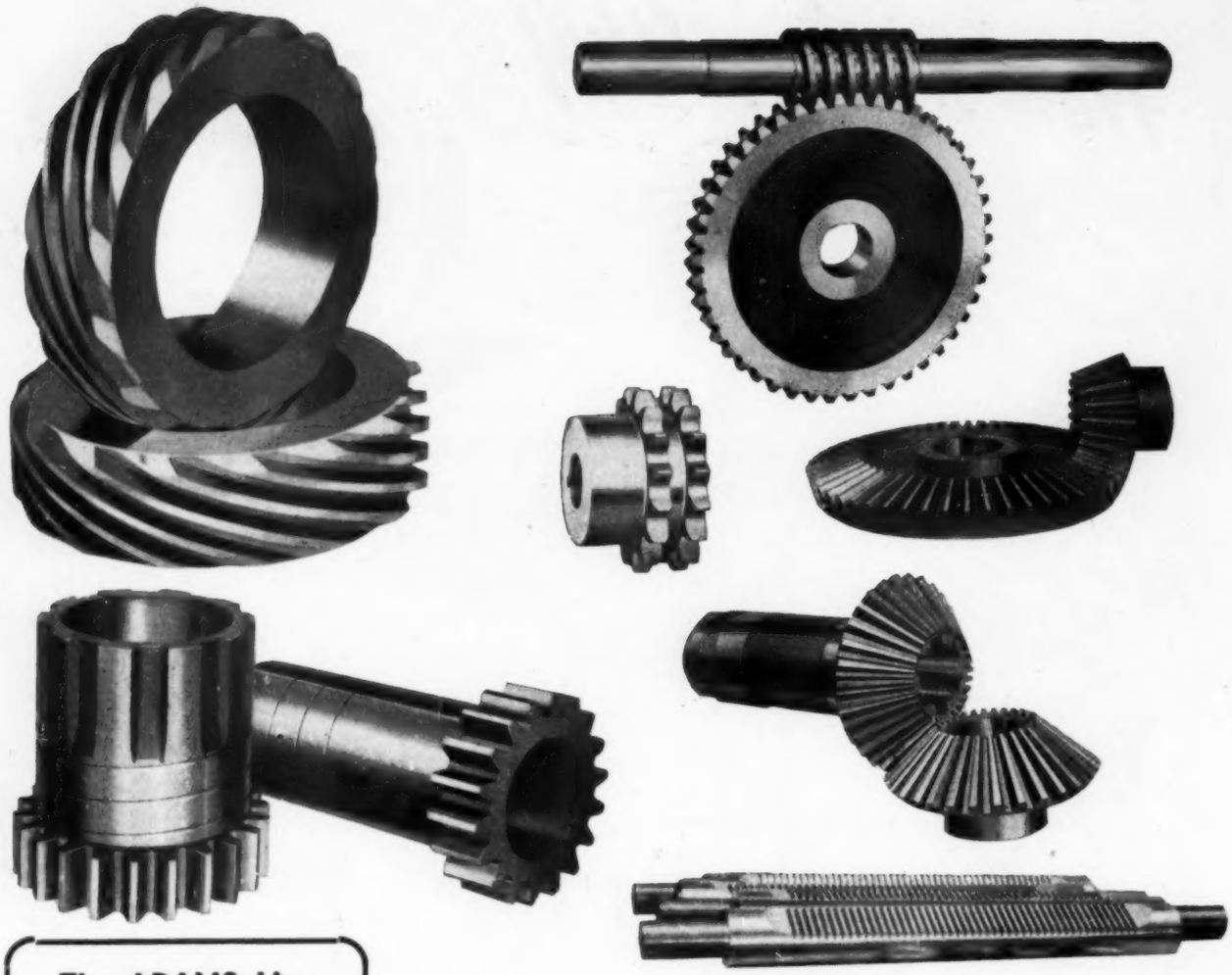
That's why it pays to know more about *all* types of motors . . . their operation . . . limitations . . . maintenance. And there, too, is where your Allis-Chalmers motor expert can be of real help! ALLIS-CHALMERS, MILWAUKEE.

A 2328

1847 1947 A CENTURY OF SERVICE to Industry THAT MADE America Great

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment-
Biggest of All in Range of Industrial Products



The ADAMS Line

Spur Gears
Helical Gears
Bevel and Miter Gears
Worms and Worm Gears
Internal Gears
(spur and helical)
Sprockets
Ratchets
Splined Shafts
Racks
Lead and Feed Screws
Ground Tooth Gears
(spur and helical)
Shaved Tooth Gears
(spur and helical)
Ground Thread Worms

Speed up assembly time with ADAMS custom made gears

Experience has proved that gears made *especially* for the job can often simplify and speed up assembly. Custom made gears can be designed with assembly problems in mind and save hours and dollars out on the assembly floor. While your product is still on the boards, plan on using Adams precision-made gears—built by craftsmen, *exactly* to your specifications. THE ADAMS COMPANY, 1942 Bridge Street, Dubuque, Iowa.

The ADAMS Compa

Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1863

CARBIDE BURS STAR ON STAINLESS STEEL

Another Cost-Cutting Application of These Amazing P&W Tools

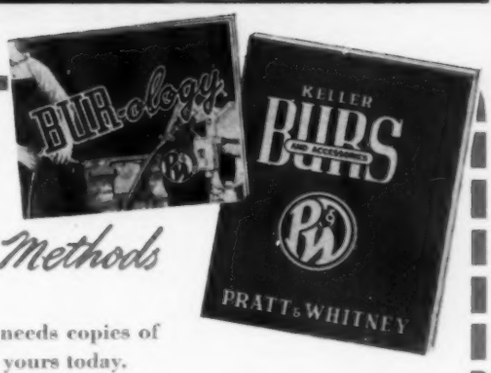
Notoriously tough to cut — stainless steel has always presented finishing headaches. But today many shops have found the answer to their problems with P&W Keller Carbide Burs.

In the picture at right a Keller Shape P Bur (just 1 of the 53 types available) wades into welds on a stainless milk cooler. Excess metal is cleaned up far faster than by conventional methods and the resulting finish is comparable to fine grinding.

Such jobs are typical of the time and money-saving applications that are making P&W Keller Carbide Burs increasingly popular with production men all over the country.

For with these machine-ground, super-efficient burs you can alter dies hardened up to 65 Rockwell C and cut at an amazing speed through cast iron. More than that, they'll outlast ordinary steel burs 75 to 1 and up. When finally worn dull they can be returned to us and resharpened like new — ready to start work all over again.

No matter what your finishing and burring operations, let the men who developed the world's most advanced line of flexible-shaft equipment help you find a money-saving short cut. Just bring in or send a sample of the job you want done. P&W's Kellerflex engineers will be glad to work out the right answer for you.



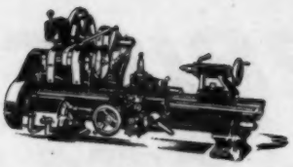
The last word on Flexible-Shaft Equipment and Methods

Every metalworking engineer needs copies of these two new books. Send for yours today.

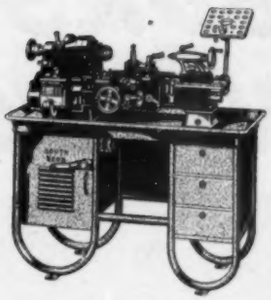
PRATT & WHITNEY

Division Niles-Bement-Pond Company

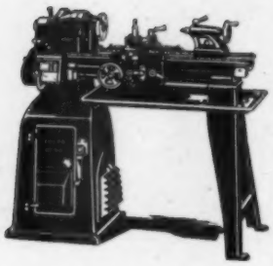
WEST HARTFORD 1, CONNECTICUT



9" Model A Bench Lathe
$270



10" Toolroom Bench Lathe
$1039



10" Quick Change Gear Lathe
$718

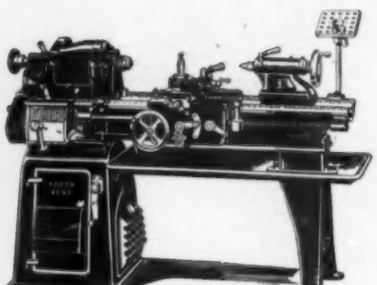
SOUTH BEND LATHES for accurate production operations and exacting toolroom work. Six sizes available — as illustrated, plus 16/24" swing for large diameter work. Also, Precision Turret Lathes with ½" and 1" maximum collet capacities; 9", 10", or 16" swing over bed.

DELIVERY—See your local distributor today for immediate delivery from his stock or early delivery from factory.

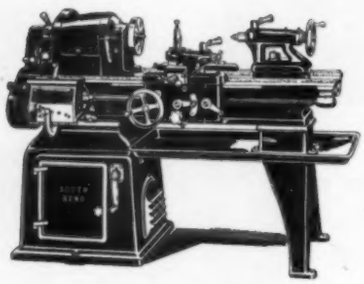
PRICES—Start at $145.00, f. o. b. factory. Average increase is less than 15 per cent over prewar price level.

TIME PAYMENTS—South Bend Lathes available on terms of 25% down, 12 mo. to pay. Moderate finance charge.

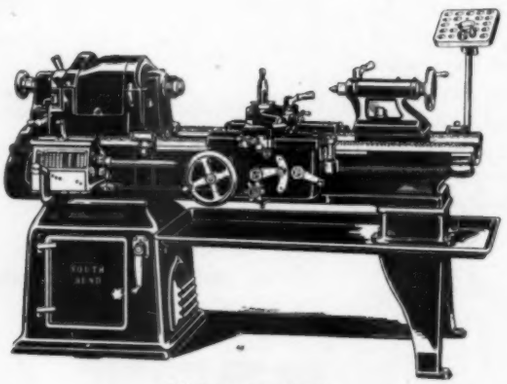
See your South Bend distributor today!



13" Toolroom Lathe
$1418



14½" Quick Change Gear Lathe
$1309



16" Toolroom Lathe
$1958

SOUTH BEND LATHE WORKS

BUILDING BETTER LATHES SINCE 1906 • 419 E. MADISON ST., SOUTH BEND 22, INDIANA

VULCAN EQUIPMENT LIST

. . . and a word about what it means to you

Prospective customers and friends have often asked us for an equipment list.

We have as often wondered why they wanted one. Naturally, we are proud of our tool room, but such a list, long or short, can only represent capital outlay for certain machine tools.

How this tool room equipment is used in producing your special tool needs is of prime importance.

Tool room equipment lined up from here to Main Street would be an impressive sight, but useless to you if the products flowing from this "impressive sight" were less than ordinary.

We wish we could list the mental equipment of our employees and executive personnel—it would be far more impressive and valuable to you. Perhaps our customers can tell you. Write us for their names—you are welcome to contact them direct, and find out for yourselves **the integrity, the brains, and the plus** we manage to get from our tool room.

Anyway, herewith the list. It will have changed considerably (for the better) a few months from now, for we are old in background and experience, young in ideas, and **modern as to equipment.**

ENGINEERING · PROCESSING · DESIGNING · BUILDING · DIES · JIGS · GAUGES · FIXTURES · SPECIAL MACHINERY MANUFACTURING · VARIOUS CONTRACT SERVICES

WRITE FOR THIS LIST

Name_____

Title_____

Firm_____

Address_____

_____

Vulcan Tool Co.

DAYTON 10 · OHIO · U S A

COMPLETE TOOLING PROGRAMS

PUT IT ON THE BLANCHARD

The one best way of grinding three-way pieces

THE JOB

Produce a true flat surface on the central flange of the illustrated cast iron Three-Way Pieces—removing an average of 1/8" of stock from the rough casting.

THE METHOD

The parts are held in simple, inexpensive, mechanical, clamping fixture. 12 of these fixtures are held magnetically on a 36" chuck of a No. 18 Blanchard Surface Grinder.

BLANCHARD PRODUCTION

Actual grinding time for each load of 12 is 4 to 5 minutes. Floor-to-floor time is 60 pieces (60 surfaces) per hour.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

This job illustrates the ease of adapting BLANCHARD GRINDING to the machining of flat surfaces of odd-shaped pieces. One operation quickly produces the required smooth, accurately sized, flat surface on the entire chuck load of parts. The grinding wheel of a Blanchard takes broad cuts over a large surface area continuously—removing metal at all times—*not* grinding air. This results in greater accuracy, finer finish, and better production. In short, BLANCHARD GRINDING is the one best way of producing flat surfaces on most of the products of modern industry.

Blanchard Engineers will be pleased to study the adaptability of Blanchard Grinding to your odd-shaped work. Just send us the data with, if possible, samples. Blanchard Consultation Service and Sample Grinding are free for the asking and involve no obligation.

BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

New Method Eliminates *3* Machines

A direct labor saving of 83% and yet a smaller capital investment than for conventional machines! That's the remarkable record of a new Transfer-matic which drills, countersinks, and taps rear axle housings.

Six machines with six operators were required under the old method where parts were transferred from machine to machine by hand. This Transfer-matic, consisting of three machines with automatic transfer mechanisms, requires only one operator—eliminating five operators and three machines.

It is another example which proves that it pays to "Consult Cross to Cut Costs."

PART: Heavy Duty Truck Rear Axle Housing.
OPERATION: Drill, countersink, tap 12 holes on carrier side, 12 holes on cover side, and 3 holes in each of the two brake pads—a total of 90 operations per cycle.
PRODUCTION: 57 pieces net hourly at 80% efficiency.
EQUIPMENT: 1 Cross Transfer-matic.
FEATURES: Flexibility to expand or alter sequences provided by self-contained transfer mechanism and machine units. Accumulation of work stresses eliminated by individual clamping and releasing of the part in each machine. Automatic work cycle electrically interlocked and controlled from a single push button station. Simplified maintenance through extensive use of duplicate standard Cross units. Hydraulic feeds for drilling and countersinking. Lead screw tapping.

Investigate Cross Transfer-matics—the newest machine tool development for continuous automatic production.

THE CROSS COMPANY

Established 1898

©1947—THE CROSS COMPANY

SPECIAL MACHINE TOOLS

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

DETROIT 7, MICHIGAN

FIG. 732
Drawer is extra
Patd. & Pats. Pend.

Fig. 2197

HALLOWELL

SHOP EQUIPMENT OF STEEL . . .

built for long service and hard wear

Fig. 1855

Every requirement of shop and factory can be filled efficiently with "Hallowell" Shop Equipment of Steel. It includes: Work-Benches, Foreman's Desks, Tool Cabinets, Stools, Chairs and Trucks—in a wide variety of styles and sizes — built of sturdy, hard-wearing steel — a construction that has made "Hallowell" a ***buy word.***

"Hallowell" Ready-Made Work Benches of Steel are definite assets to any shop. Strong and sturdy, they're designed to stand firm and rigid without costly bolting to the floor—to withstand constant use and abuse. More than 1300 combinations . . . interchangeable sections . . . five heights and widths and seven standard lengths. The "Hallowell" can be moved easily and individual benches can be joined end-to-end to form a continuous work bench of any length.

For further details, write for your "Hallowell" Catalog.

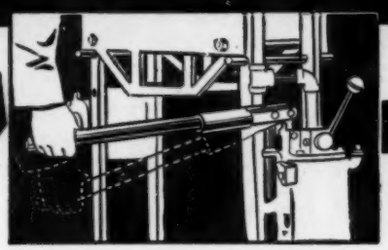
"Hallowell" Products are sold entirely through Industrial Distributors.

OVER 44 YEARS IN BUSINESS

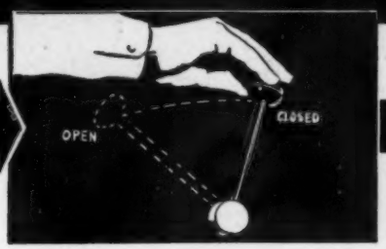
STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX [redacted] • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

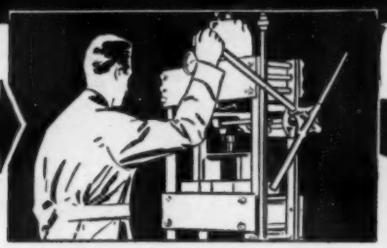
These KRW Hydraulic Arbor Press Features ...



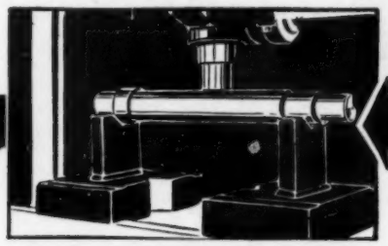
Fast Action, cylinder is filled as ram travels to work. You get tons of pressure with first pump stroke.



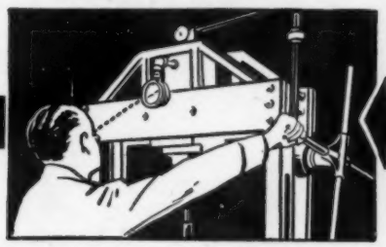
Finger Tip Control opens and closes valve in a jiffy. No gripping effort assures easier, faster operation.



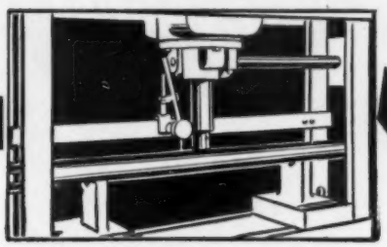
KRW Built-in Mechanical Press permits up to 3 tons pressure for straightening small diameter work.



One Piece, All Steel V-Blocks have machined surfaces for greater accuracy; usable upright or inverted.

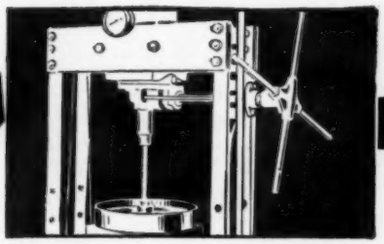


Highly Visible Pressure Gauges are mounted where they can be quickly checked. Read in tons and pounds.

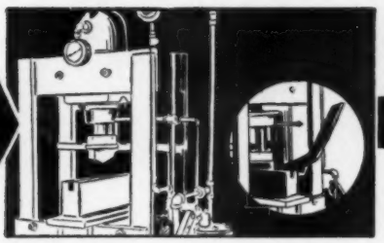


Micrometer Dial Attachment permits great accuracy in checking work without removing from V-block.

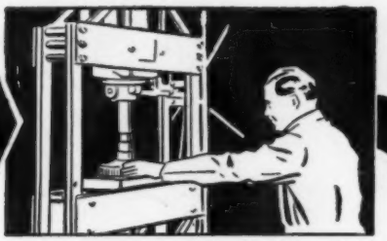
Reduce Costs ON THESE AND OTHER DAILY Production Jobs ...



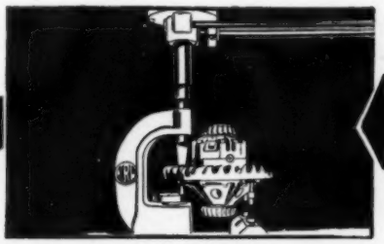
Broaching a key way in a flywheel. 7½ inch ram travel makes many broaching jobs practical on KRW Presses.



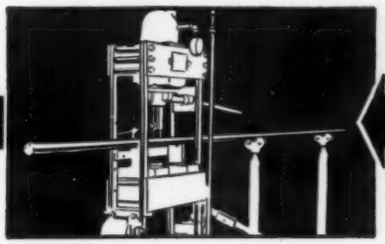
Bending in production lots with simple, inexpensive dies is easily done on low-cost KRW Hand-operated Presses.



Pressing of all types is efficiently handled. Adjustable bed makes pressing on long shafts a very simple operation.



Riveting with KRW Riveting Attachment is simplicity itself. Many KRW Presses are used for this type work.



Straightening, especially on long work, is easy on a KRW Press because of its special open-end construction.

Blanking is easy with simple die set for short-run operations. Releases regular equipment for quantity production.

Write for the **NEW KRW** *Catalog.....*

K·R·WILSON

215 MAIN STREET, BUFFALO 3, N. Y.

K. R. WILSON, 215-217 Main St., Buffalo 3, N. Y.

Please mail me a copy of your Hydraulic Arbor Press Catalog 11

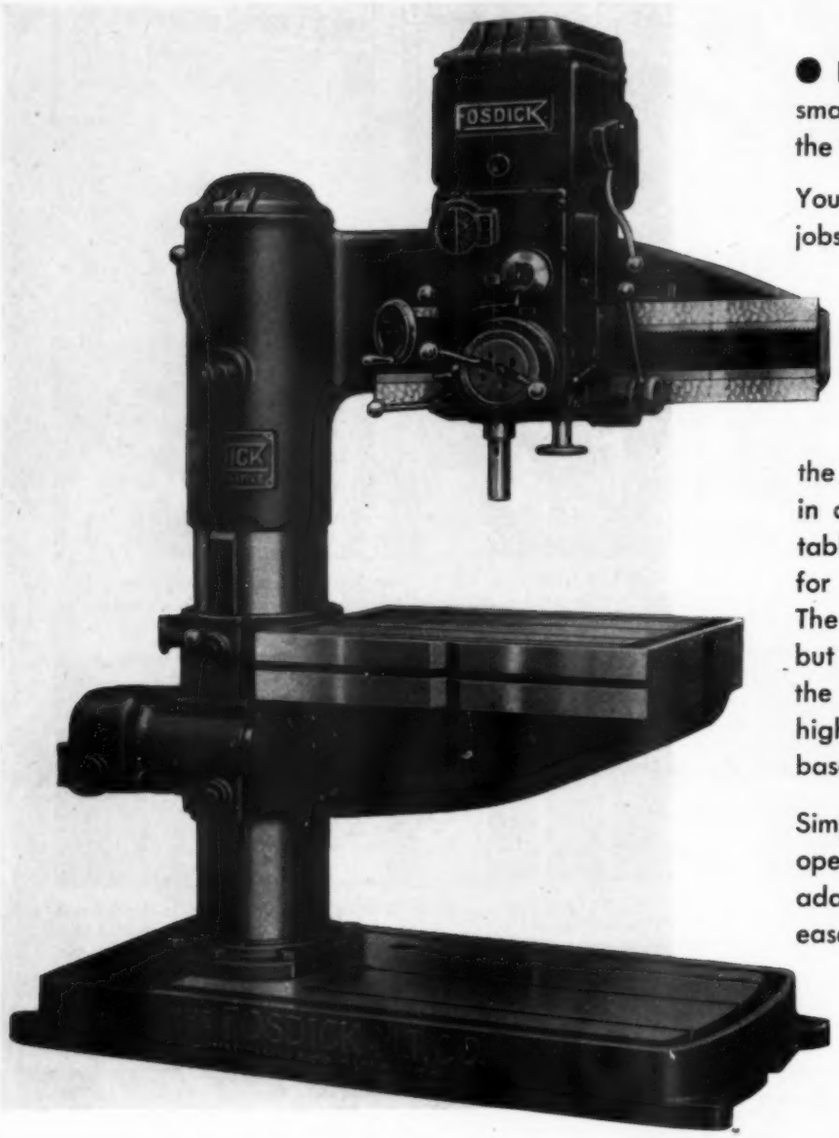
Name .....

Address .....

City ..... *Zone* ..... *State* .....

When you need Radial Performance on Sensitive Drill Operations

Get a FOSDICK *Sensitive Radial*



● Here's the answer for a multitude of small hole sensitive drill jobs that require the flexibility of a radial.

You can eliminate costly fixtures on many jobs, get the accuracy required and produce a wider variety of work at lower costs.

The new Fosdick Sensitive Radial has a fixed arm with a moveable table which slides up and down the column. Both table and arm swing in an arc of 360°. This design permits table to be placed in correct position for any job suitable for the machine. The head is always at the same height but the moveable table may be swung to the rear of the column to accommodate high work which can be mounted on the base of the machine.

Simplicity of design—construction—and operation are features which pay-off in adaptability to a wider range of work—ease of operation—and low costs.

Ask for the Sensitive Radial Bulletin S. R. A. for further details.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

Helicopters made by Bell Aircraft were recently used to spray swarms of flying locusts in South America. A 98% kill was reported.

get ready with CONE for tomorrow

The Naval Research Laboratories are "growing" artificial quartz crystals for use in electronic devices.

be ready with CONE for today

The U. S. Bureau of Standards has developed a method of plating with nickel or cobalt that requires no electric current.

get ready with CONE for tomorrow

A magnified chart showing the shape, height and spacing of long waves, steps, fine roughness and other irregularities on machined or finished surfaces is provided by the Proficorder — a new Physicists Research Co. shop instrument.

be ready with CONE for today

Air speeds up to 7,000 miles per hour can be simulated for study by towing models at much slower speeds in a shallow tank of water. The method is in use in North American Aviation's Aerophysics Laboratory.

get ready with CONE for tomorrow

Goodyear Tire and Rubber Co. cements automobile brake linings directly to the brake shoes eliminating rivets. More surface is provided and longer wear without scoring results.

be ready with CONE for today

Fibrous insulation composed of pure silica and capable of withstanding 2,000 deg. F. is being made by H. I. Thompson Co. of Los Angeles.

get ready with CONE for tomorrow

Photographic prints produced in a specially equipped automobile immediately after exposure were transmitted by radio to the editor's desk at the NEW YORK DAILY MIRROR eight minutes after the event pictured.

American-La France-Foamite Corp. is making a two-car parking meter which halves the cost of installation.

be ready with CONE for today

Color printing by radio facsimile is now possible with a process called "Colorfax" developed by Finch Telecommunications Inc.

get ready with CONE for tomorrow

The underground gassification of coal for the commercial production of power has been proved feasible by the Alabama Power Co.

be ready with CONE for today

The Automatic Signal Division of Eastern Industries, Inc. has a device for measuring the speed of vehicles in traffic that is based on the reflection of a radio wave from the surface of a moving vehicle.

Pennsylvania Railroad is using a mobile X-ray machine to examine metals in locomotives, cars, rails and other equipment.

get ready with CONE for tomorrow

In California the Bakersfield Machine Co. sells welders' supplies directly from a truck to oil fields, farmers, factories and welding shops.

be ready with CONE for today

American Locomotive Co. has a waste-heat boiler that operates on diesel engine exhaust.

get ready with CONE for tomorrow

A small air-driven drill made by Aro Equipment Corp. has a ¼-inch chuck and turns 26,000 r.p.m.

be ready with CONE for today

Fruehauf Trailer Co. is making prefabricated truck bodies that can be assembled by the dealer in a few hours.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Can YOU equal this

in 12 seconds?

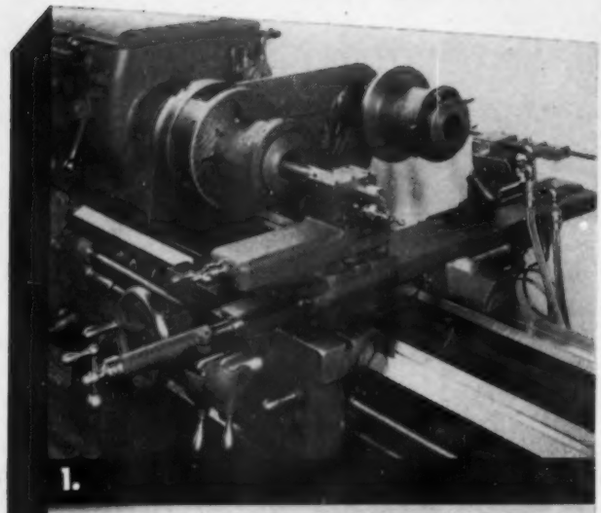
The above shaft was machined by a 1⅜" 8-Spindle Conomatic in 12 secs., with 16 tools, from SAE 1030 — ⅞" rd. stock.

Ask your CONE *representative to show you our new color motion picture*

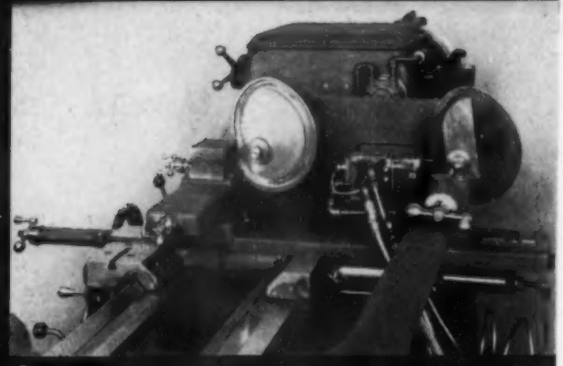
CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

46



1.



2.

3.

SPRINGFIELD
Profiling Attachment

Here's the hit of the Show—a really versatile Hydraulic Profiling Attachment for Springfield Lathes that will duplicate your difficult jobs from bottle molds to complicated cam forms.

The two units available cover a broad field of duplicating. The turning unit handles either exterior or interior duplicating on work such as bottle molds, rolls, and other jobs where the desired shape is parallel to the center axis. The facing unit is used for press molds, formed facing cutters, and jobs where the duplicating is at right angles to the center axis.

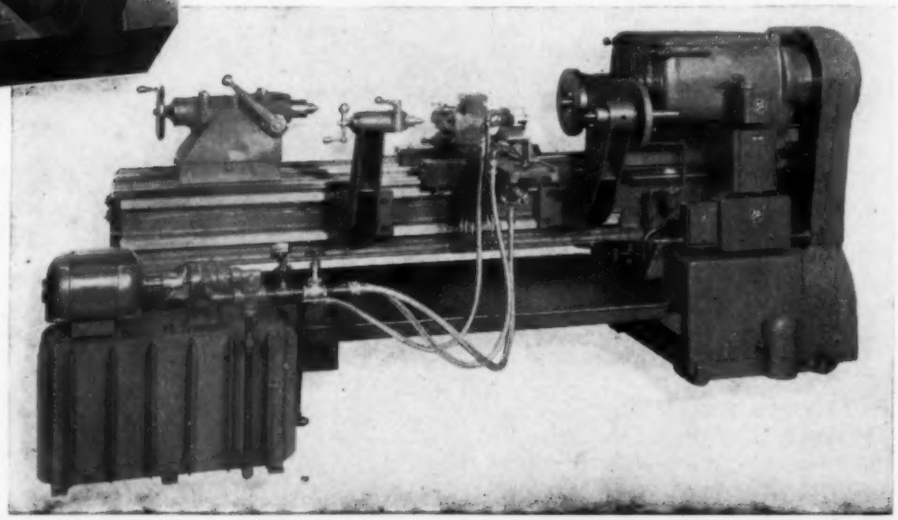
A number of types of masters and templates may be used and may be rotated between centers of the template holding brackets or may be held stationary in template holding fixtures. The template holding brackets utilize the taper attachment ways on the rear of the bed and are accurately aligned with center axis of the lathe to assure extremely accurate results.

The control valve is carried on the rear of the cross slide and the actuating cylinder, mounted on the rear of the carriage, is adjustably attached to the cross slide permitting duplication up to the capacity of the machine. The control valve can be swiveled to accommodate the various conditions encountered on work of this type.

The compact hydraulic power unit is separate and may be located convenient to the machine. Flexible high pressure hose connects the unit with the actuating cylinder and the control valve.

The operator can work from his normal operating position as there are no complicated mechanisms and controls to interfere with efficient operation of the lathe on either duplicating or normal lathe work.

Not only is the machine flexible in adaptability to various profiling operations but can easily and quickly be converted to regular lathe work. Because of this flexibility, it is recommended for all types of lathe work as well as duplicating operations.



1. Illustrating method of duplicating bottle mold from original mold with Turning Unit.

2. Illustrating use of a revolving flat, thin sheet metal template for contour cam turning.

3. Illustrating arrangement of Facing Unit to work at right angles to spindle.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD • OHIO • U.S.A.

Made in one wallop to withstand 900 wallops per minute . . .

it's an ALCOA IMPACT EXTRUSION

This valve lifter for a heavy-duty diesel engine operates up to 900 strokes per minute and has to maintain a clearance of from 0.0025″ to 0.0035″. The best way to make it at lowest cost, with the fewest machining operations, is as an Alcoa Aluminum Impact Extrusion. The metal is Alcoa 14S Aluminum, with a typical tensile strength of 68,000 pounds.

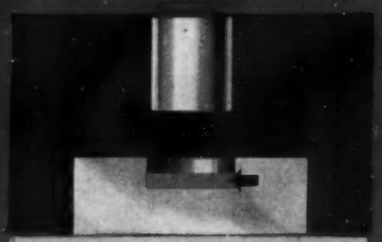
Almost any part that is generally symmetrical can be impact-extruded. The dimensions are close and accurate . . . less finish machining is required.

Some intricate parts that could not be made by any other process are readily designed to be impact extrusions . . . you can let your design ideas take on new, moneysaving slants. Aluminum is light to reduce loads and inertia, strong to bear weight and impact.

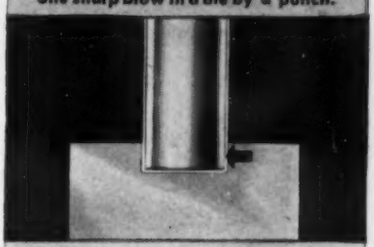
Let us show you samples of parts that have been made as Alcoa Aluminum Impact Extrusions. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa. Sales offices in leading cities.

MORE PEOPLE WANT **MORE** ALUMINUM FOR **MORE** USES THAN EVER

HOW THEY'RE MADE . . .



1. A slug of aluminum is struck one sharp blow in a die by a punch.

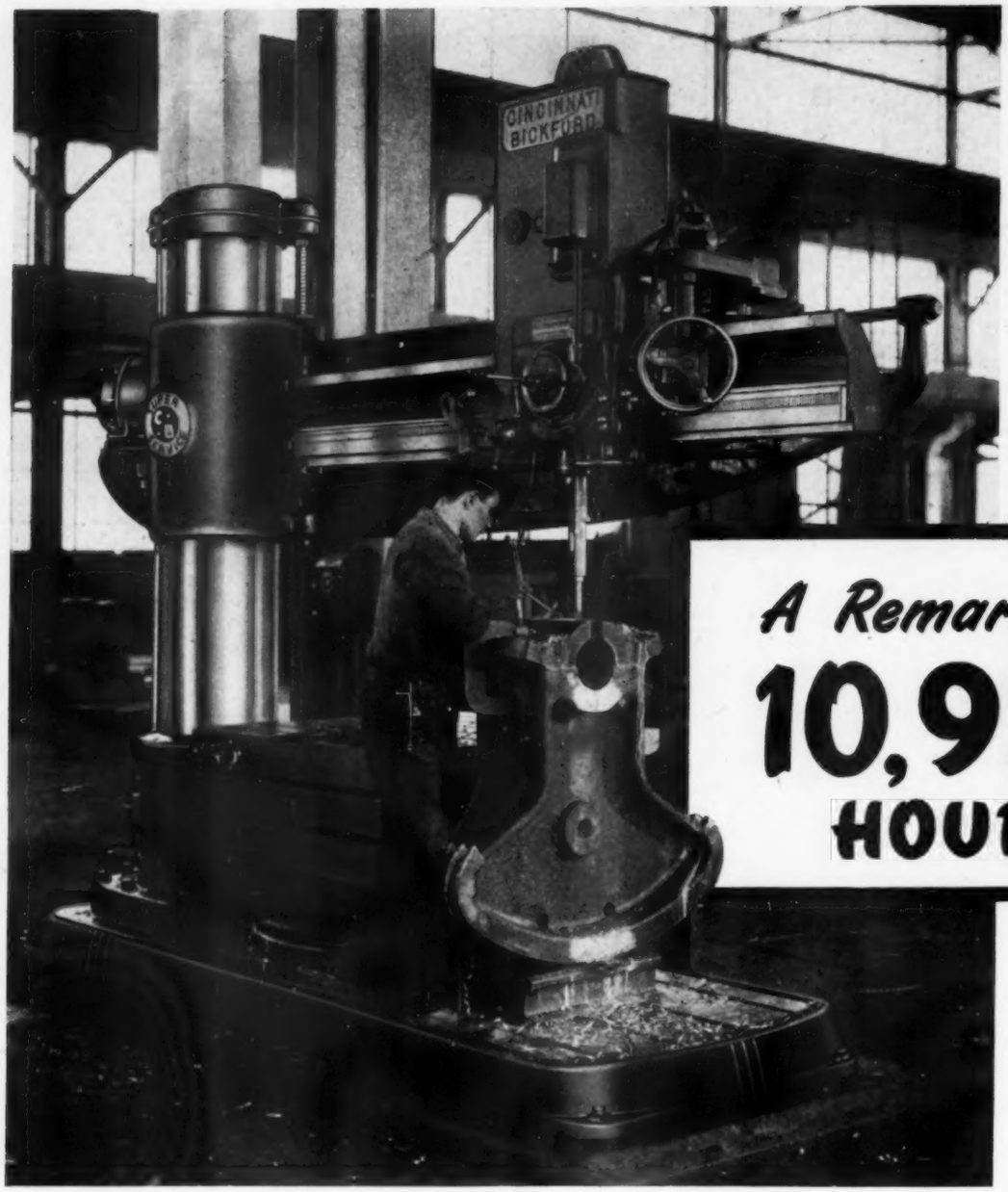


2. Because the die is larger than the punch, the metal *flows* out of the die and *shoots* up the punch.

3. The space between the die and punch determines wall thickness. The external design features are incorporated in the die, the internal in the punch.

ALCOA FIRST IN ALUMINUM

IN EVERY COMMERCIAL FORM



A Remarkable 10,950 HOURS

Perhaps the greatest test of both materials and workmanship in a machine is the test of uninterrupted production.

A Cincinnati Bickford Super Service Radial Drill was on a 24-hour schedule for 15 months at the Pittsburgh Steel Foundry, Glassport, Pa.

They tell us that the operators of this machine were not highly skilled but, due to the extreme simplicity of operation, did a fine job—and maintenance cost was zero over this period.

For durability, easy of operation and high production, use a Bickford Super Service Radial Drill.

Write for Bulletin R-24A.

THE CINCINNATI BICKFORD TOOL CO.

RADIAL AND UPRIGHT DRILLING MACHINES

SUPER SERVICE

Radials 7½" dia. col., 2½' arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28".
Jig Borers, Portable Horizontals, Spacing Table Machines.

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

ELECTRONIC HEATER CUTS COST 63%
. . . DOUBLES HATCHET-HARDENING OUTPUT

THE JOB . . .

An operation essential to the manufacture of hatchets at Mitchell and Unsinn Company, Washington, D.C., is heat-treating, in order to harden the blade and head surfaces.

THE OLD METHOD . . .

Hatchets were conveyor-fed through a preheating zone, an open gas flame for differential heating, and finally into a receiving cage, immersed in an oil bath. After hoist-dumping into a bin, each hatchet was cleaned. If heads also required tempering, the entire process was repeated. To perform these operations, three workmen were required.

THE *NEW* INDUCTION METHOD

An operator now positions the hatchet blade in the work coil of a G-E 20-kw electronic heater, where each blade is uniformly hardened and automatically quenched in a matter of seconds. If the head is to be hardened, the timing controls are reset and the head is run through. Cleaning operations are no longer necessary.

HERE'S WHAT INDUCTION HEATING HAS DONE FOR THIS COMPANY—

1. **Cut Costs**—Former methods, requiring 3 men, were estimated to cost $3.80 per hour; the induction method with only one operator has a total hourly cost of $1.39.

2. **Increased Production**—Former methods produced 650 blades per day, while 1300 are now realized with the induction method.

3. **Reduced Floor Space**—With the compact, automatic electronic heater, bulky handling and conveyor equipments are no longer required.

4. **Better Working Conditions**—The induction installation is clean, cool, and convenient. No more high ambient temperatures or oily floors.

WHAT CAN INDUCTION HEATING DO FOR YOUR PRODUCT?

We would welcome the opportunity to give you an unbiased answer to this question. Simply get in touch with the Heating Specialist in the nearest G-E Office. In the meantime, send the coupon for our free bulletins GES-3290A, "The How and What of Electronic Induction Heating," and GEA-4637, "G-E 20-kw Electronic Induction Heater."

Apparatus Department, Sect. D675-172
General Electric Company
Schenectady 5, N. Y.

Please send me your free bulletins GES-3290A, "The How and What of Electronic Induction Heating," and GEA-4637, "G-E 20-kw Electronic Induction Heater."

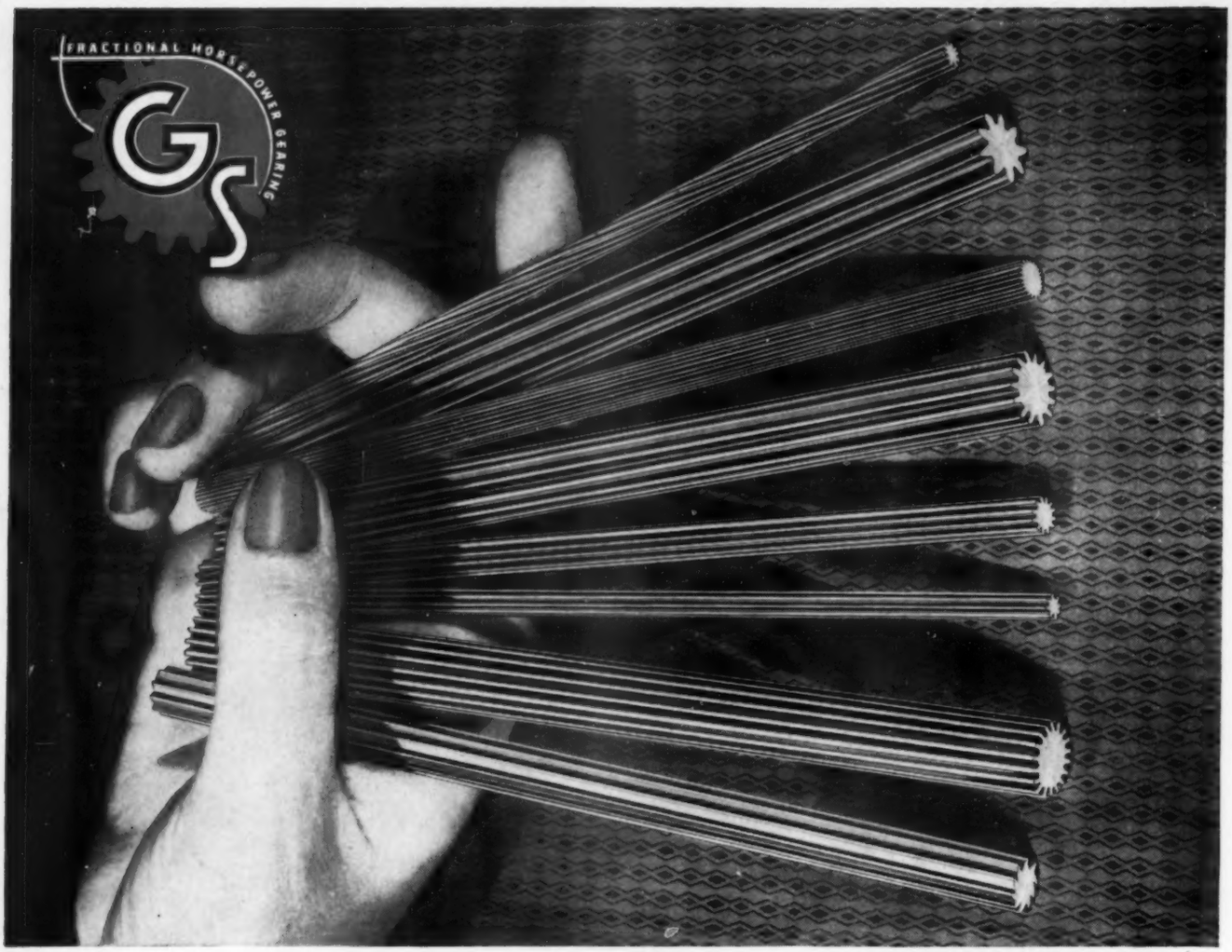
Name_____

Company_____

Address_____

City_____ State_____

GENERAL ELECTRIC



WANT *SMOOTHER RUNNING* GEARS?

EXTREME *accuracy* is the key to the smoother performance of the gears we make. Although quantity runs are produced in record time, each gear is cut to closest tolerances and to the most exacting specifications. Among the many different types of Fractional Horsepower Gears in which we specialize are straight and spiral pinion rod and special shapes in pinion rod form. These are cut with the same precision and uniformity as are other G.S. Small Gear products. You can get pinion rod in brass, steel or any other material in continuous lengths up to ten to twelve feet. ★ Let our skilled engineers and the highly developed facilities at their command help you make a *smoother running*, more dependable, longer lived product. Send us samples, drawings or descriptive material today. Our suggestions, ideas, and moderate cost estimate incur no obligation.

The G.S. Gear Bulletin illustrates and describes many different types and applications of G.S. Small Gears. It offers valuable aid to anyone concerned with specifying Gears 12 D.P. and finer. Ask for it on company stationery, please.

SEND FOR OUR CATALOG BULLETIN

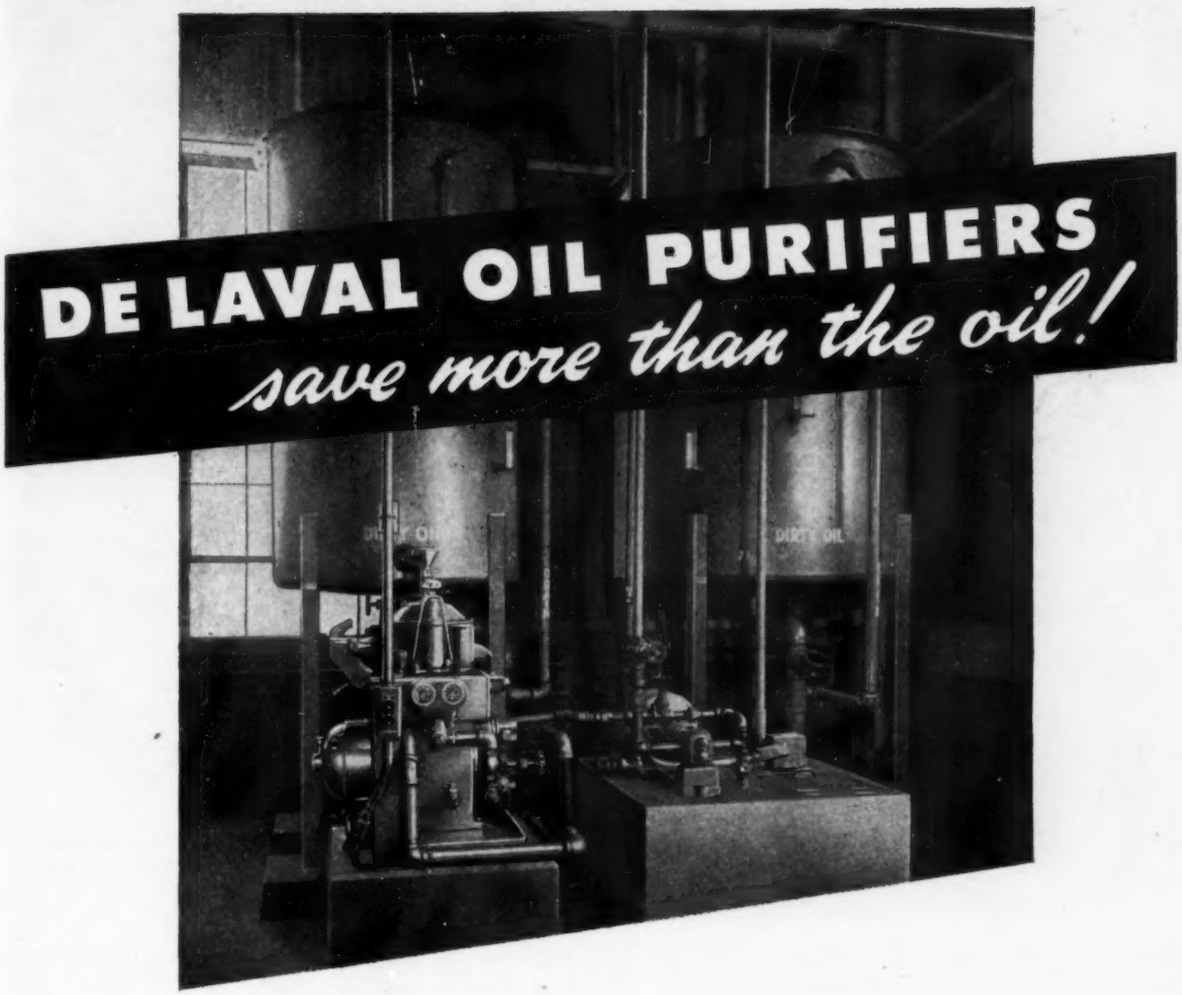
GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS



DE LAVAL Oil Purifiers remove by means of centrifugal force the solid impurities and water that contaminate cutting oils and coolants. Continuously and instantaneously these machines keep the oil in first class condition and enable it to be used over and over again. This is a basic source of savings in metal-working plants of all sizes, and is a sufficiently profitable reason for purifying factory oils by means of De Laval units.

Equally important is the effect on tools and on the work. By purifying cutting oil this way, for example, the life of the cutting tool itself is greatly prolonged, machine "down time" is reduced and more consistently accurate work can be obtained. Here, too, is another source of profit.

A great many of the applications for De Laval Oil Purifiers in metal-working plants are outlined in Bulletin FF.

• Why not write for a copy?

DE LAVAL

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DELAVAL COMPANY, Limited, Peterborough, Ont.

PURIFIERS AND CLARIFIERS FOR FACTORY OILS

PRESS PRODUCTION

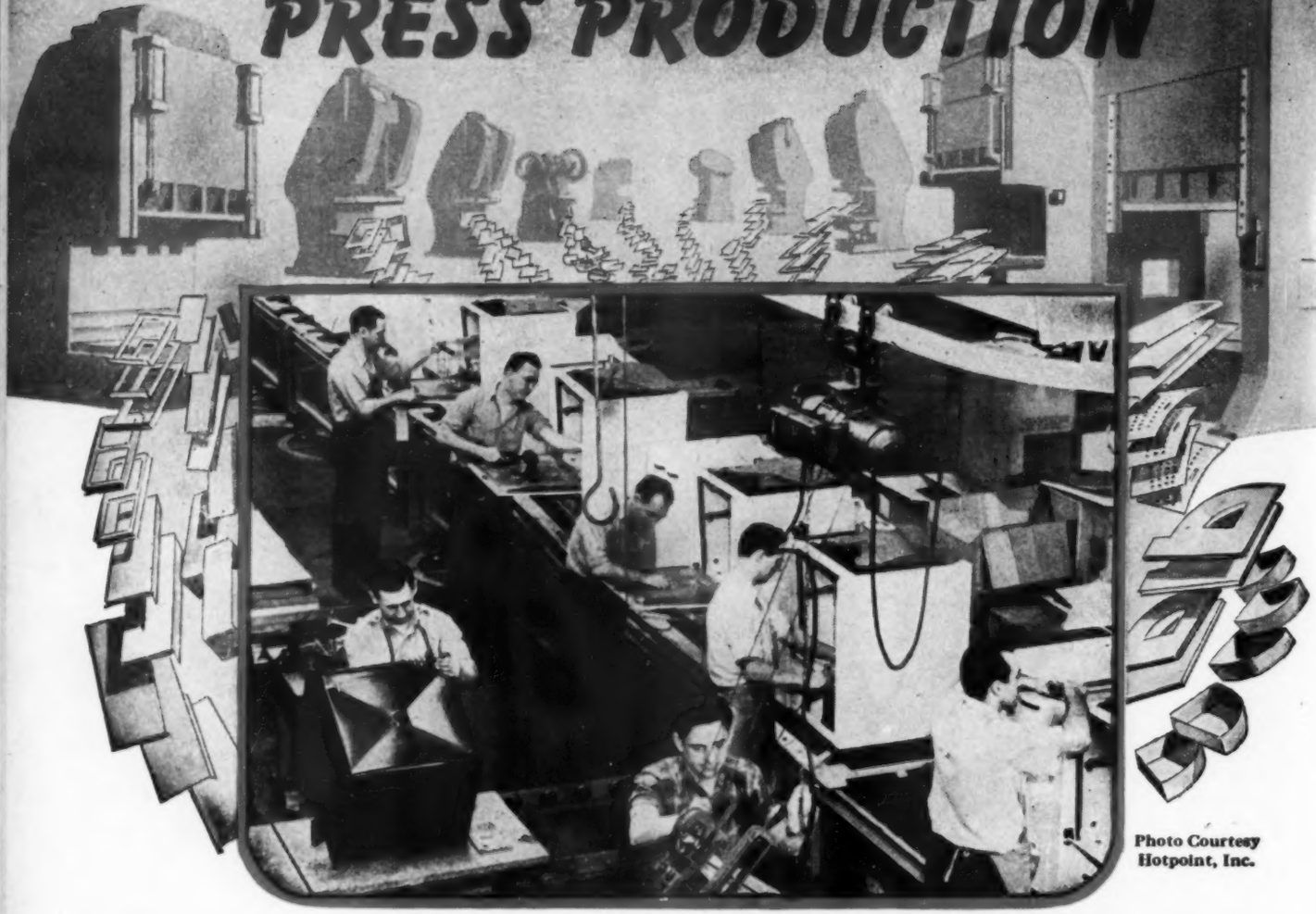


Photo Courtesy
Hotpoint, Inc.

FEEDS THE ASSEMBLY LINE

The Assembly Line—symbol of American Mass Production—depends on a rapid and constant flow of finished parts to each stage of the assembly.

Largely responsible for keeping the line moving, Presses provide the fast, all-around production of duplicated metal parts that modern standards of production demand.

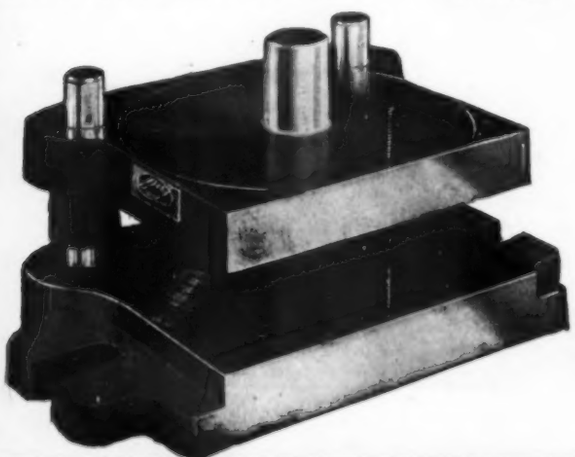
Danly Die Sets—a *necessary part of good Presswork everywhere*—speed die making programs, protect costly dies, cut down time for regrinds. Danly Die Sets and Die Makers' Supplies are nationally recognized for *known dependable accuracy.*

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois

DANLY
National Assembly

Call Danly

- **MILWAUKEE 2**
  111 East Wisconsin
- **DETROIT 16**
  1549 Temple Avenue
- **CLEVELAND 14**
  1550 East 33rd Street
- **DAYTON 2**
  990 East Monument
- **ROCHESTER 4**
  16 Commercial Street
- **PHILADELPHIA 44**
  18 W. Chelten Avenue
- **LONG ISLAND CITY 1**
  47-28 37th Street
- **DUCOMMUN METALS & SUPPLY CO.**
  4890 South Alameda, Los Angeles



DIE MAKERS' SUPPLIES
DANLY DIE SETS
Welded Steel Fabrication

American Machinist's Spot NEWS OF METALWORKING

Japanese machine tool builders are said to be approaching certain American builders seeking permission to make the latter's machines in Japan.

A number of smaller metalworking companies are deep in negotiations for a third round wage increase. Cases already settled indicate that advance will range from 5 to 12 cents an hour though in certain industries local unions are asking as high as 22 cents.

One steel company, desperately in need of pig iron, is getting some tonnage from Norway, but must pay for at least part of it by shipping steel plate in return.

Replacement orders to the producers of DC-6 airliners for a new type of fiber glass insulation, composed of a vinyl resin blanket covering the bulk fiber, over which is placed another covering of glass and vinyl fabric, are in the process of preparation by the CAA. The old type of fiber glass insulation was blamed for the spread of flames and helped bring about the grounding of DC-6 planes. The new substance will not act as a wick or burn, according to the CAA.

Detroit's factory payrolls now stand at a new postwar high and definite scarcities are noted for tool and die makers and other skilled craftsmen. In the latter category are included sheet metal workers, electrical wiremen, machinists, millwrights, patternmakers and the like.

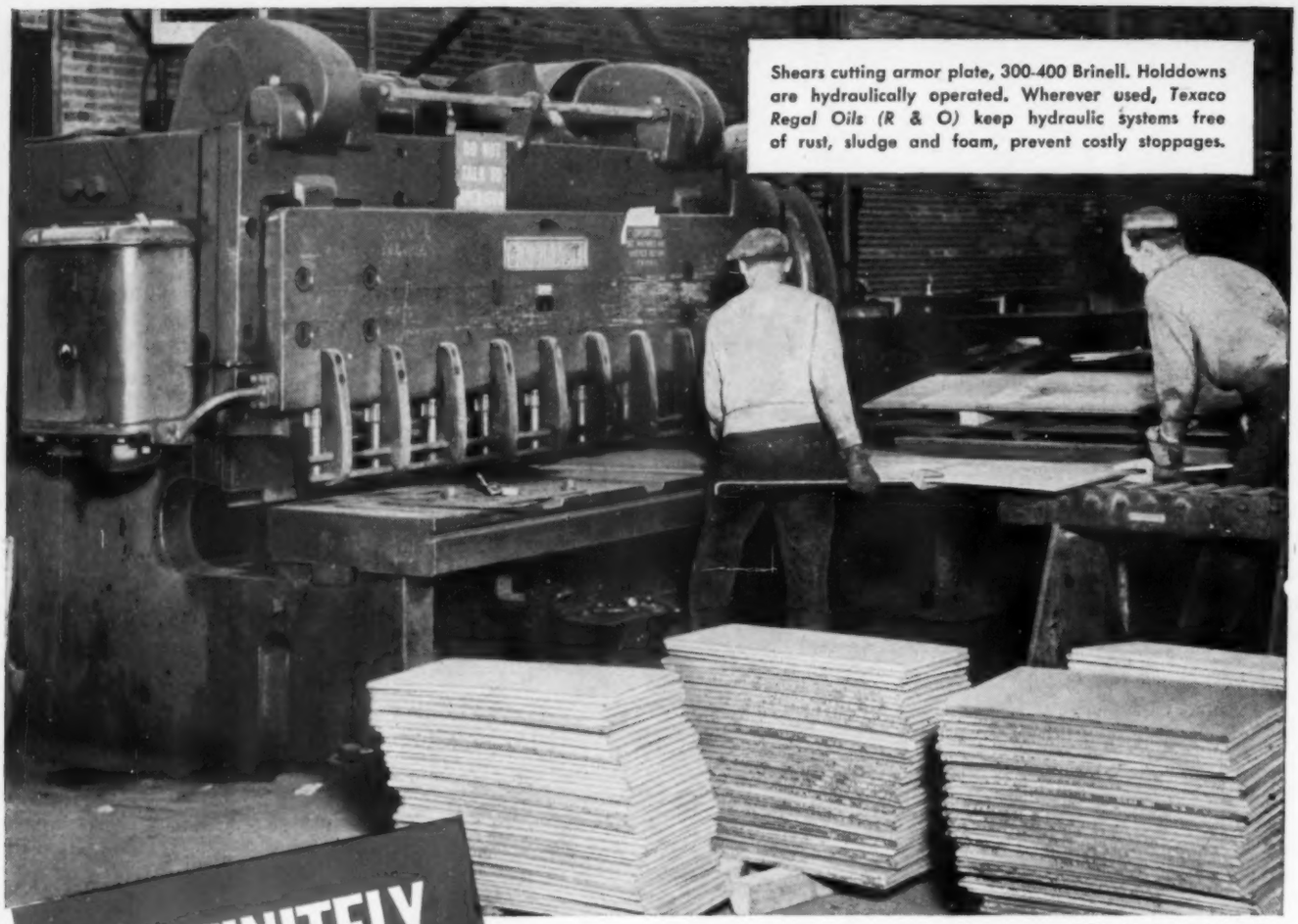
> Extension of export controls over 36 additional iron and steel products, effective Jan. 1, 1948, has been announced by the Office of International Trade, Commerce Department. Continued short domestic supply has brought about this latest action, which brings 95% of the exports of steel mill products to all destinations except Canada under control. Added to the list are: plates, structural shapes, sheet piling and skelp, railway track materials, semi-finished products, bars, sheets, cold-rolled and hot-rolled strip, pipe, tubing, wire, railroad specialties and forgings.

Employers must bargain with unions over insurance and pension plans, according to the CIO United Steel Workers. Trial examiners for the NLRB have ruled that two companies committed unfair labor practices when they put such plans into effect without consulting the union, which is a bargaining agent for the employees covered. The cases are now before the board.

Consolidation of alumina plants in the Middle West with the Pacific Coast base metal and fabricating plants is being studied by the Big Three—Aluminum Co. of America, Reynolds and Kaiser. Purpose would be to make aluminum in a single operation. One reason for present studies is the fact that aluminum coming into the country will be 1c. a pound cheaper due to tariff cut. Power surveys in Pacific Northwest and Alaska are being made.

The magnesium industry's only producing plant is reported due to close shortly. This is attributed to a drop from a 400-million-pound wartime peak consumption to about 36-million in 1947, coupled with the fact that some 100-million pounds of the metal are on hand. Magnesium experts also warned the government recently that increased consumption of magnesium must be developed to keep the industry in a state where it would be possible to expand immediately in the event of an emergency.

Railroads are seeking their fourth freight rate increase since the first of the year, as was predicted by American Machinist recently. Although the latest request for a 3% boost is not as high as expected, it still brings the total requested advance over the present level to better than 30%. Specifically the roads now want a 41% increase in the Eastern district and 31% in the rest of the country. With the various commodity rate exceptions the average for the entire country is raised from 27% to about 30%.



Shears cutting armor plate, 300-400 Brinell. Holddowns are hydraulically operated. Wherever used, *Texaco Regal Oils (R & O)* keep hydraulic systems free of rust, sludge and foam, prevent costly stoppages.

Photo courtesy of The Cincinnati Shaper Co.

A "DEFINITELY BETTER" WAY... to prevent rust and sludge in hydraulic systems

DON'T let improper hydraulic fluid plug up your hydraulic mechanisms — keep them free of rust and sludge by using *Texaco Regal Oils (R & O)*. These are turbine-grade oils effectively inhibited against rust and oxidation (the cause of sludge), and specially processed to prevent foaming.

From plants everywhere come reports of lower maintenance costs and smoother hydraulic operation for longer uninterrupted periods with *Regal Oils (R & O)*. As one user expresses it, "They are definitely better than other oils."

Texaco Regal Oils (R & O) are recommended by leading hydraulic equipment manufacturers—many of whom ship their units already filled with them.

Whatever the type or size of your hydraulic units, there are *Texaco Regal Oils (R & O)* in the suitable viscosities to assure their efficient operation. For full information, call the nearest of the more than 2500 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

TEXACO

TEXACO Regal Oils (R&O)

FOR ALL HYDRAULIC UNITS

TUNE IN . . . TEXACO STAR THEATRE presents the TONY MARTIN SHOW every Sunday night. • METROPOLITAN OPERA broadcasts every Saturday afternoon.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Practical Help to Europe

The Marshall program makes no specific provision for the acquisition of machine tools and other production equipment by the countries affected. It should.

It is excellent for us to provide food, and farm machinery, and other aids. It is necessary for us to supply fuel and certain raw materials.

Washington should bear in mind, however, that our chief concern is to make the western European nations self-supporting again. We do not wish them to be a continuing and onerous burden to our own taxpayers.

If we are to help them to help themselves, we should send them the capital equipment with which to restore and expand their industries. They should have a sufficient quantity of the master tools essential to produce goods for their own people.

They need production equipment. The report of the President's committee on foreign aid said that the western European nations require "some capital equipment to further the rehabilitation of industry."

Proof of this need is the backlog of orders for American machine tools in the hands of French importers, to mention only one case. French metalworking manufacturers desperately want equipment from our country. They cannot get it, except in dribbles, because the shortage of dollars prevents their government from granting import licenses.

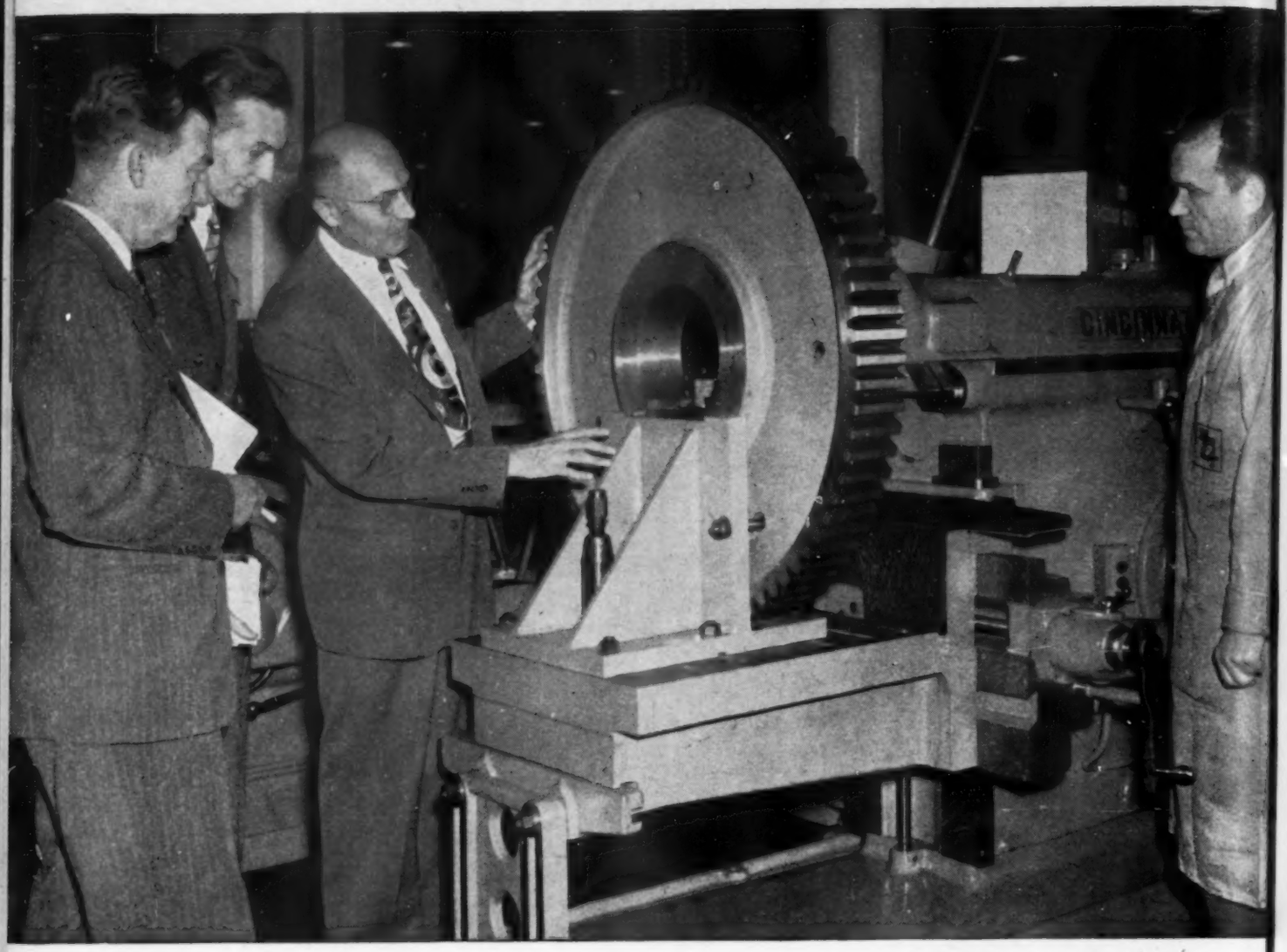
These machines cannot be obtained in satisfactory quantities elsewhere than in the United States. Machinery builders in other countries have full order books, and in general cannot make reasonably short deliveries. The placing of orders for this equipment with American builders would put no strain upon the industries involved here. No domestic customer would be deprived of a single machine. Our machinery producing capacity is ample to take care of all demands arising from the Marshall program in addition to the requirements of domestic user.

With machine tools and other production equipment so vital to prompt rehabilitation of western European industries and with plenty of facilities at hand in this country to supply this machinery, why is it that the Marshall program completely bypasses these items?

Here, then, is a serious deficiency in the Marshall program which should be remedied promptly. It is not too late to do it. If reasonable quantities of capital equipment are included, as recommended by the President's committee, the rehabilitation of western Europe's industries will be speeded incalculably.

Burnham Finney

EDITOR



* Demonstration at Machine Tool Show, Chicago

HANDY!

There is always another job you can do on a Cincinnati Shaper—*"the handy man of industry"*. Planing, contouring, keyways, angular work, internal shaping—all are regularly done with simple tooling and quick setups.

With the use of practical and inexpensive accessories, many awkward and unusual jobs are done simply and economically along with the regular work.

When you put a Cincinnati Shaper on the floor, that floor space pays dividends.

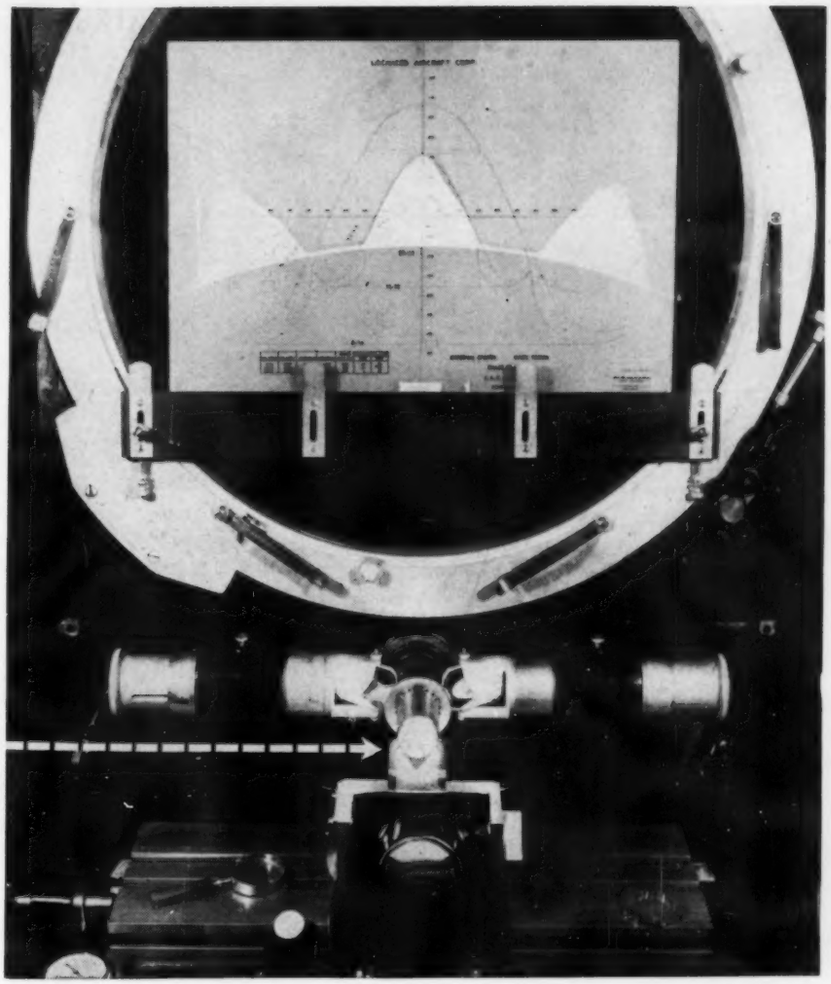
Write for catalog N-3.

* Cutting keyways in these large gears—which were both heavy and awkward—was done on a Cincinnati Heavy Duty Shaper equipped with a table with removable top, a boom crane, and a simple, inexpensive fixture. Can we help you with your special job?

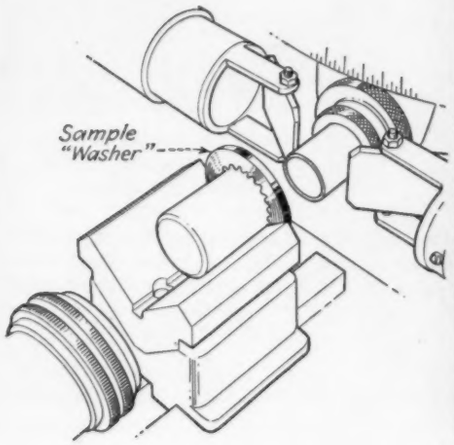
THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



Tooth space profile of a broached washer is compared with the basic chart gage (right) to check contour deviations of internal splines against manufacturing tolerances. The drill-rod supporting piece for the washer (below) is machined to minor diameter of splined sample, so that the latter can be revolved to check all teeth. A micrometer thimble and dial indicator are used for accurate measurement of comparator-stage movement



Shadowgraph a Sample to Find Tool Errors

By machining a "section" of the piece, along with a trial lot, tool deficiencies can be found immediately through the optical-comparator method

BY C. H. BODNER
Formerly Standards Engineer, Manufacturing Standards Dept.
LOCKHEED AIRCRAFT CORPORATION

EXPERIENCE at Lockheed demonstrates that much waste can be saved in manufacture of interchangeable parts if the tools are first checked against chart gages by the optical-comparator method.

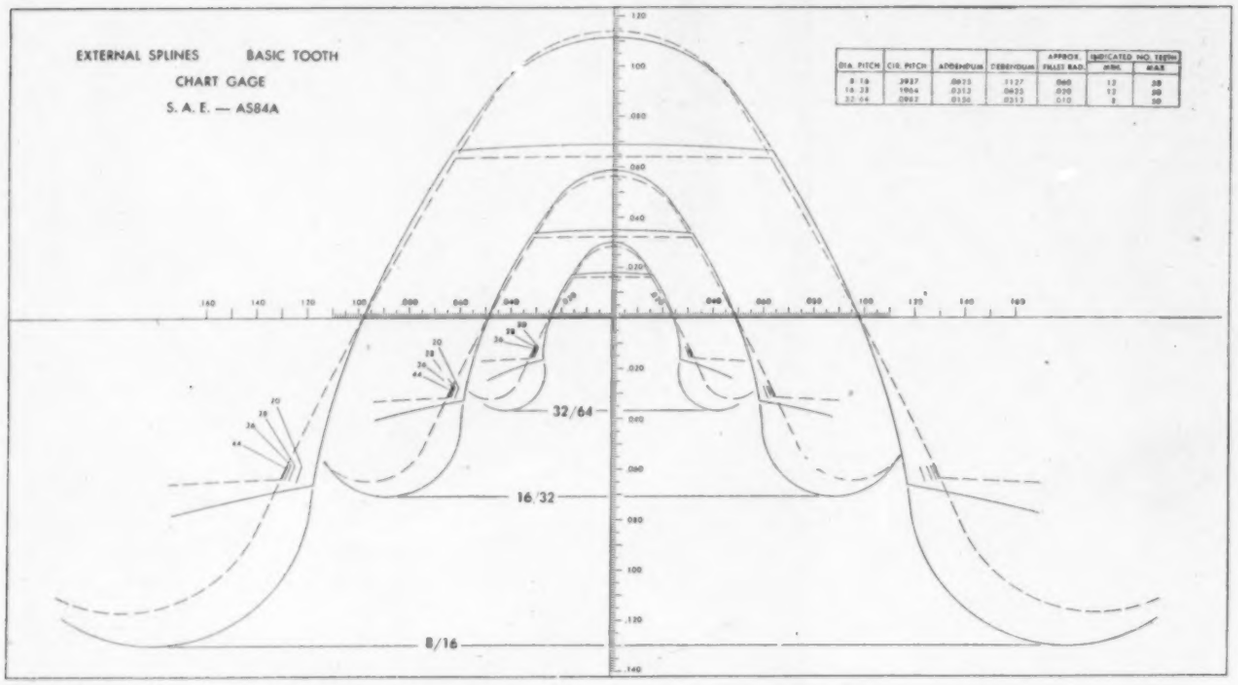
The tool-checking process can best be illustrated with respect to splined members, although the general idea may be applied elsewhere if it is possible to machine a "section" of the work along with a trial lot, so that a profile of the cut is obtained.

The checking technique for spline hobs and broaches was developed through troubles in making splined members on an interchangeable basis. These members required an involute spline of 30° pressure angle, and were made to the SAE's Standards Bulletin AS84A basic specifications, plus manufacturing tolerances established by the Lockheed engineering department. In brief, pitch diameter tolerance was 0.002 in. maximum, a sliding fit was required and the parts had to be interchangeable.

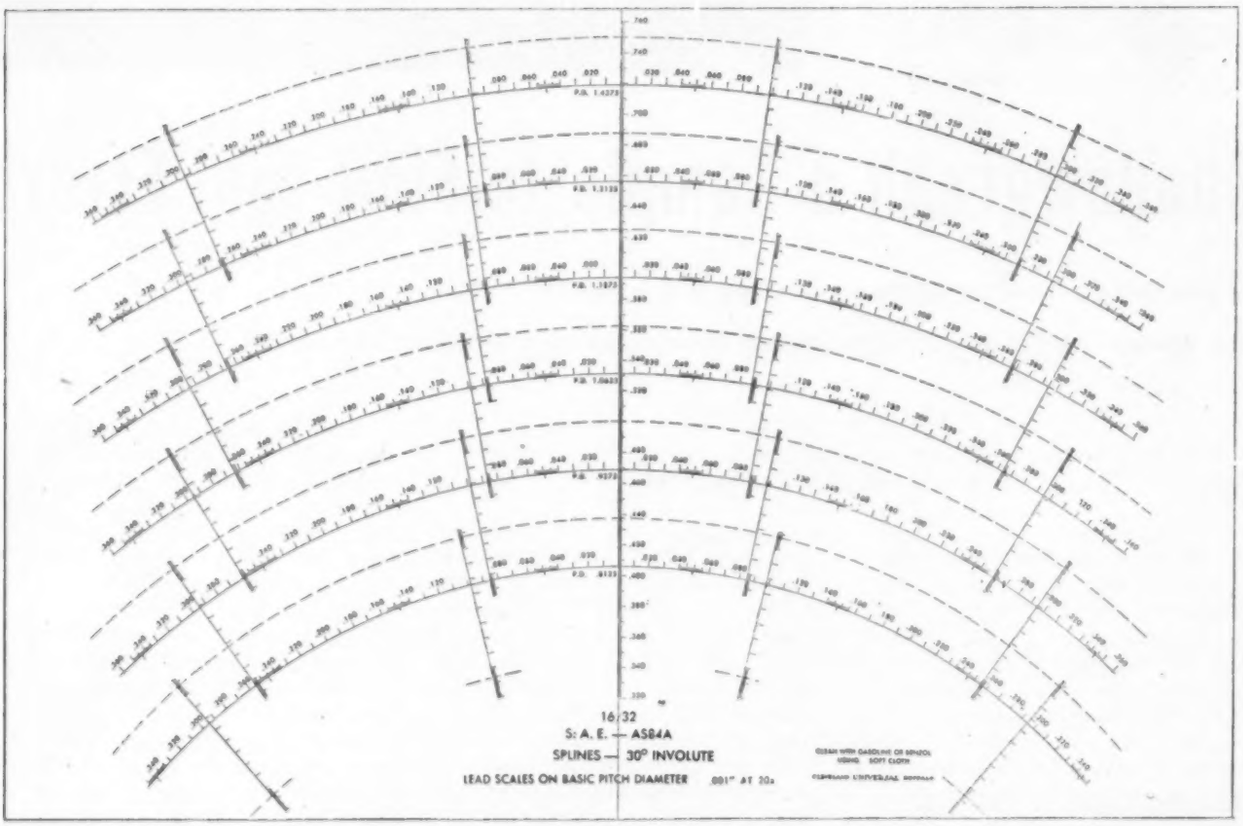
Parts passed by mechanical gaging methods were not interchangeable when brought to assembly. So, a thorough tooth-by-tooth analysis was instituted for both the hobbed external spline and its internally broached mating member.

Projection of the form by an optical comparator was considered the proper way to handle analysis of the splined members. Flat washers of the correct O.D. and I.D. were locked against the end of the shaft and hobbed at the same time. Broach samples were made by holding several washers together and drawing the broach through. These "sections" of the workpieces accurately reproduced the action of the tools and

BASIC CHART GAGES FOR CHECKING SPLINED MEMBERS



Tooth forms for 8/16, 16/32 and 32/64 diametral pitches are laid out on the chart gage at 31¼ magnifications. The solid line in each case is the basic profile for the minimum number of teeth, according to the SAE specification AS84 A; the dash line is for the maximum number of teeth. The horizontal scale, reading in 0.001 in. increments, coincides with the chordal pitch line of all three tooth sizes



Lead scales on pitch diameter for six P.D. sizes of 16/32 splines are laid out from a common center (20 magnifications). Four teeth or spaces can be checked at a time, each centered on the indicated radial lines. Solid-line graduated arcs represent basic pitch diameter; dash-line arcs represent basic major diameters

STEPS IN CHECKING TOOTH PROFILE OF SPLINES

To Center Image on Chart Gage . . Locate the stage so that the image of the drill-rod support for the broached washer is tangent to the vertical centerline of the tooth-form chart. Then move stage horizontally one-half the measured minor diameter of the sample, using the micrometer thimble or gage blocks

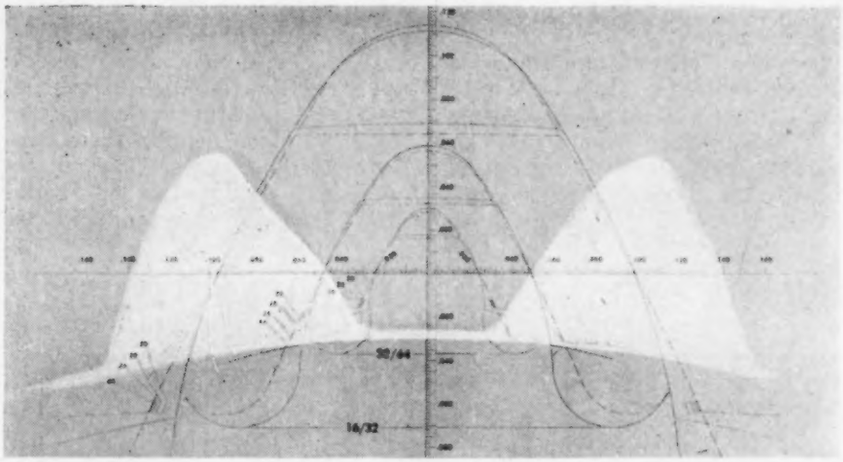
were of convenient size for easy projection on the comparator.

By developing a setup in which the washers could be revolved, errors in tooth form were found that added up to problems in tooth clearance. Unless selective positioning was resorted to, parts would not assemble. Steps were taken to correct this trouble, which arose from a deviation of one of the hob dimensions beyond the tolerances allowable.

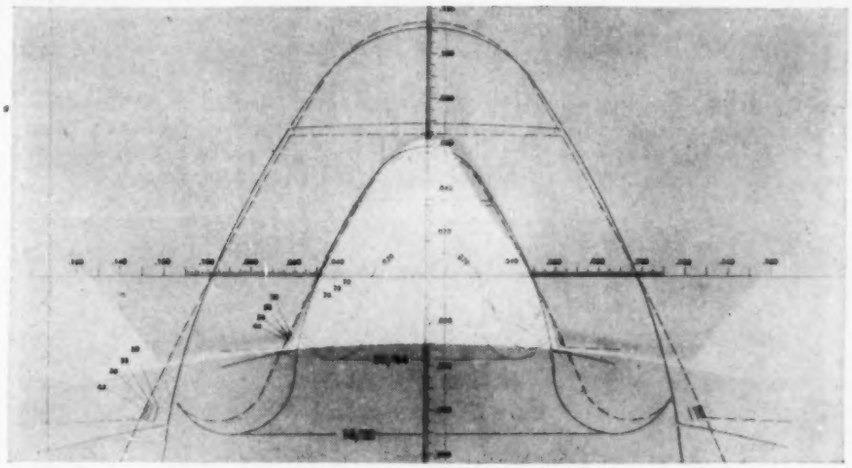
Successful use of the optical comparator, even without special charts or staging fixtures for this purpose, led to a decision to equip the device especially for spline-tooling inspection. By working with the Engineers Specialties Division, Universal Engineering & Colorplate Co., Buffalo, N. Y., two types of ground glass chart gages were perfected. The charts were:

1. A basic tooth-form chart gage.
2. Lead scales on basic pitch diameters.

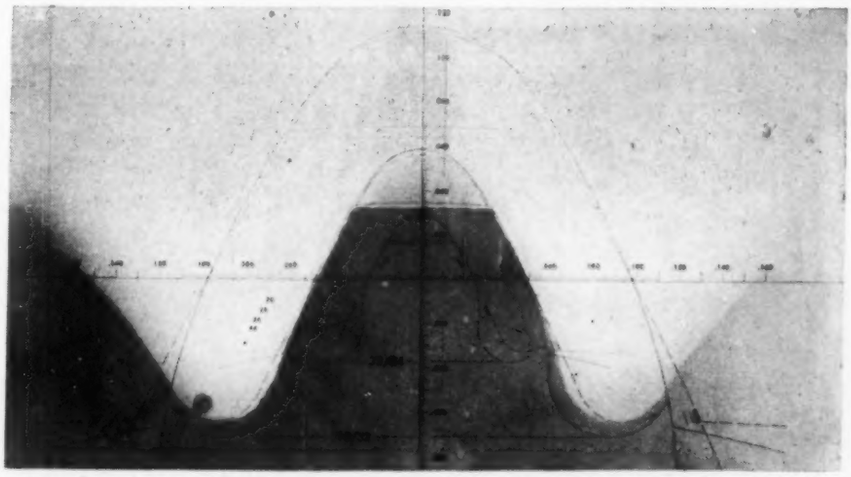
The tooth-form chart gage incorporated the three preferred sizes of diametral pitch for aircraft, namely, 8/16, 16/32, and 32/64. All three forms were placed on one plate, and extremes of outline according to



To Locate the Pitch Diameter . . With vertical leadscrew of comparator, make the minor diameter of the sample coincide with the chordal pitch line on the chart gage. Then move image down the amount of the basic addendum less actual variation from basic, as determined from measuring the minor diameter



Projection of Tooth Space Profile . . Deviations in profile may be read directly on the pitch-line scale, or at other points with an auxiliary scale of the same magnification. Since the chart gage is basic, the deviations in contour are checked against manufacturing tolerances



Projection of External Tooth . . The image is positioned on the chart gage in correct relationship to the pitch diameter by using the major diameter of the sample. Left side of tooth profile does not coincide with chart-gage profile at pitch line, indicating hob or setup error. Sample is turned tooth to tooth

number of teeth for each form placed together. A scale of varying teeth number was added to aid in basic calculations.

The three outlines were drawn on common centerlines, to which were added scales in 0.001 in. increments at the magnification employed, which was 31¼ times. The horizontal scale was on the chordal pitch line for ease in determination of tooth or space thickness of broached splines.

The second chart gage, "Lead Scales on Basic Pitch Diameter," provides means of measuring in 0.001 in. on the basic pitch circle. A vertical centerline on the chart gage was scaled in 0.001 in. increments from a common center. Then arcs of specified radius were laid out to the capacity of the plate with basic dimensions specifically indexed. A scale in 0.001 in. is laid out at strategic intersections on the pitch diameter circle. When the shadow of a spline form is projected to the scale, it can be aligned so that several teeth are intersected by the pitch line at approximate points. Measurements may be read of thickness and lead error. Accumulated error can be found by revolving the washer.

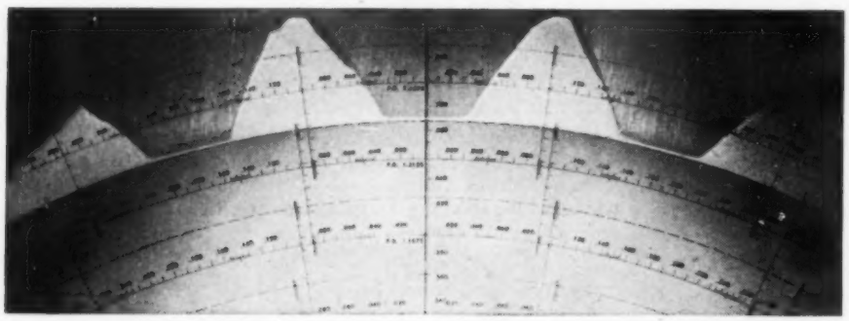
The temporary "washer" holding fixture was used at first. But a universal device is being designed to guarantee more rigid holding of a variety of sizes as well as allow for quicker setup.

The next step, namely, product inspection by the same means, awaits the determination of standard tolerances. When this is decided upon, separate chart gages will be made for individual spline specifications. Tolerances will be indicated thereon by minimum and maximum lines.

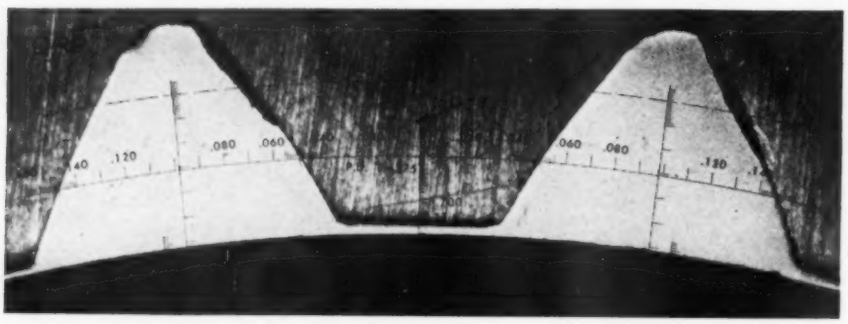
Since taking these steps, Lockheed tool inspectors are finding it easier to accept or reject hobs and broaches for spline production. When rejection is necessary, it can be done with specific, constructive criticism that saves the tool through allowing elimination of definitely specified defects. Acceptable tools are approved with full knowledge that they will do a complete job, cutting correct form, while maintaining all clearances, tooth thickness and lead. Such positive results are obtained as the ability to trace any error in the part back to the tool that produced it or the error in setup that caused it.

Any tool purchased in the future will be accurately appraised in advance of its use as to its ability to produce parts that will be interchangeable with those being made by present tools.

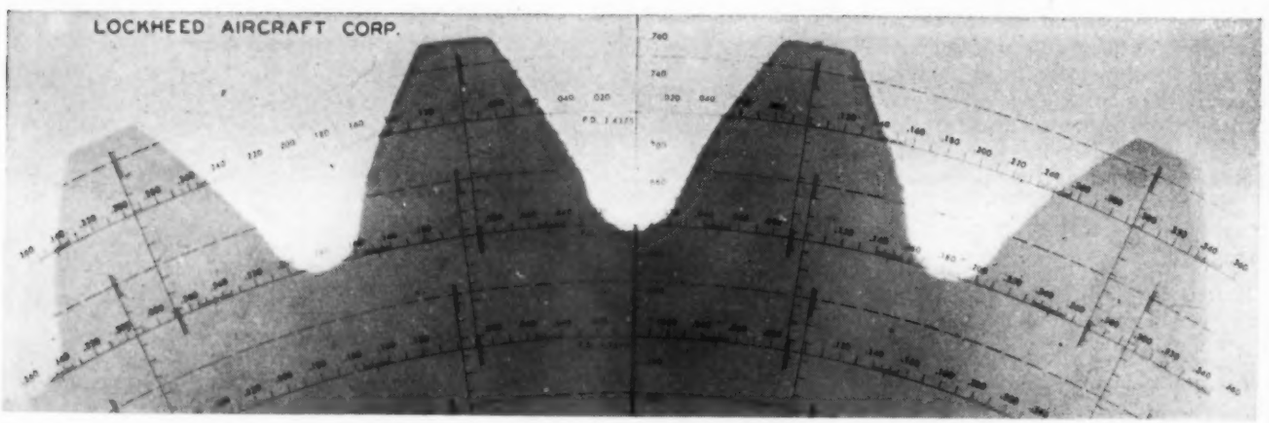
STEPS IN CHECKING CIRCULAR PITCH OF SPLINES



To Locate Image . . Center four tooth spaces on the radial lines. Variations from basic are acceptable within tooling tolerances because a broach is being inspected. Accumulated error in circulation pitch may be checked by concentric rotation of the washer, after marking one space as the starting point



Close-up Image of Internal-Spline Profile. Actual circular pitch is easily read on scale. Shadow at upper right of tooth spaces was caused by photoflash, not profile error



Projection of External Teeth. Spacing of involute-spline teeth is more critical than in gearing. Tooth spacing errors are revealed by the lead scales on the pitch line. When revealed errors exceed tolerances, corrections can be made in hob or setup before starting production, to avoid parts spoilage. Accumulated error in circular pitch can be checked by rotating sample after marking one tooth. Hob or setup errors can then be corrected

Automatic Handling for Induction Hardening

Induction hardening apparatus combined with automatic handling equipment reduces production costs for Hancock Mfg. Co.

BY G. P. CARDWELL, Consulting & Application Engineer,
Westinghouse Electric Corp., Detroit
and
M. SERVER, Plant Engineer,
Hancock Mfg. Co., Jackson, Mich.

BY INSTALLATION of radio-frequency heating equipment, the Hancock Manufacturing Company of Jackson, Mich., has been able to reduce cost of hardening grass shear blades and obtain a better quality product.

Previously, the shear blades were sent to a heat-treating company for hardening at a cost of about 2½¢ per blade. The entire blade was hardened, which resulted in distortion and made necessary individual straightening of about 50% of the blades. While the product was satisfactory, cost of blade was excessive.

A Westinghouse 10-kw., 450-kc. radio-frequency generator with rf. current transformer and automatic work-handling equipment was purchased. With this installation, cost of hardening a blade has dropped to approximately 1¢. Only cutting edge of blade is heated, eliminating warping and resultant straightening operations.

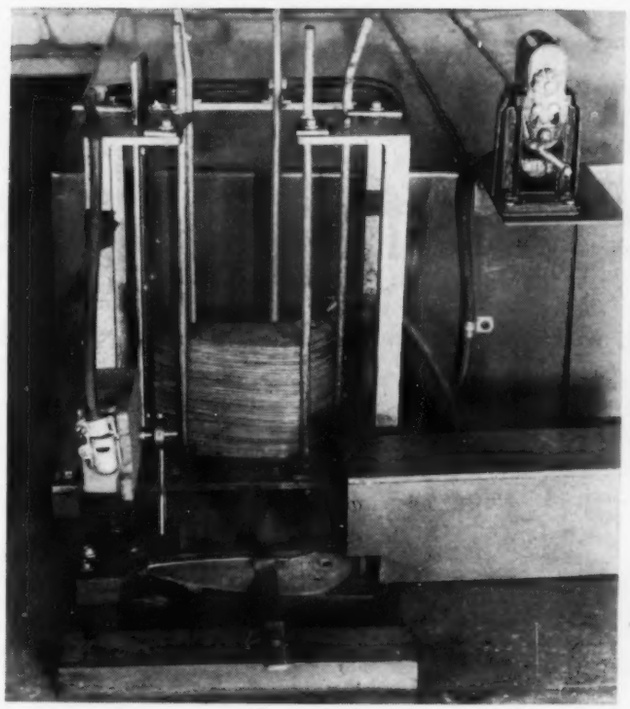
Shear blades, which have been cleansed in a hot alkali bath to remove grease and dirt, are placed on a table near work-handling equipment. Operator keeps hopper full and removes hardened blades from quench tank. After hardening, the blade is ground to produce a sharp, long-lasting cutting edge.

Blade-handling equipment consists of a motor-driven crank which actuates a selector pusher through a connecting rod. With every revolution of the crank, pusher takes a blade from bottom of hopper and positions it with its cutting edge in the inductor coil. Coil is shaped to contour of cutting edge. The generator is turned on by a cam-actuated switch, and blade edge is heated to hardening temperature. The crank makes another revolution in 4 sec., and pusher moves forward with a new blade from hopper. As this blade enters coil, the cam switch turns generator off and heated blade is pushed into the quench tank by new blade. New blade is positioned in coil, generator turned on, and process repeated.

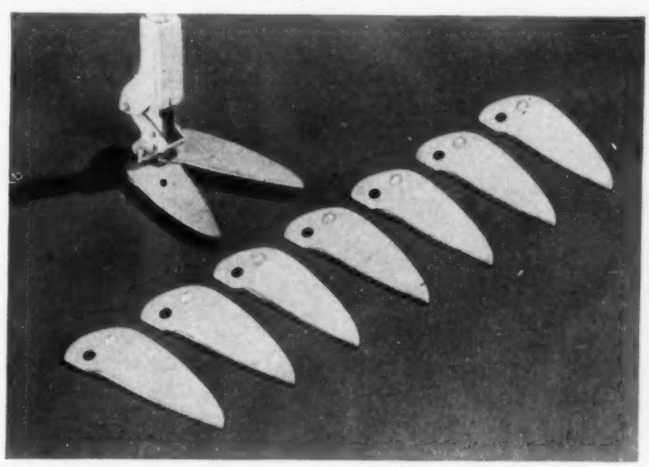
The hopper holds a 3-min. supply of blades, giving operator adequate time to remove hardened blades from quench tank. A counter keeps a record of blades hardened. Installation is completely protected. Should hopper become empty, a defective blade jam in the mechanism, or generator becomes overloaded for any reason, both generator and handling equipment are automatically turned off.

The generator obtains power from a 440-v., 3-phase, 60-cycle line. For 10-kw. output, 21.2-kva. input at 95% power factor is required. Generator is completely protected by self-contained circuit breaker, overload relays and fuses. Electrical interlocks remove all dangerous voltages when generator doors are opened, thus protecting the operator. To obtain the high inductor-coil current necessary to rapidly heat the shear-blade cutting edge, a rf. current transformer is connected between generator output terminals and coil.

The initial investment for rf. generator and handling equipment was about $7000. Operating costs exclusive of labor are approximately $0.61 per hr. This figure includes power cost at 1.5c per kwhr., tube replacements based on a 3500 to 5000 hr. average life, and amortization of generator and equipment over a period of 17 years.



Magazine workholder holds 3-min. supply of blades, feeds units one at a time to single-turn inductor coil



Several hardened shear blades are illustrated with the cutting end of a completed grass shear

A Christmas FABLE FOR METALWORKING

A Visit from the General Manager

It was a great idea after all, and they never knew who the old man was that worked in the toolroom that Christmas

BY GEORGE BURNLEY

THE heavy car screeched to a stop. A red glow from the signal colored the rain on the windshield and reflected from the heavy jowls of the general manger.

He hunched over the wheel and glared out at the rain driving across the highway. This was a mistake. But they had all ganged up on him; his wife reminding him (at least daily) that she hadn't visited her mother in years, the doctor insisting he needed a rest, Charlie swearing they could handle things all right at the home office.

But you can't play golf in Centerville in December. Visiting relatives is no way to rest either. And after that labor trouble last spring, a visit to the Centerville plant wouldn't be likely to ease those taut nerves the doctor was yelling about. It was time he asserted himself around his own home.

A man crossed the road. He was wearing coveralls and a pea jacket; there was a lunch box tucked under one arm, and he hunched into the rain as he skirted the puddles.

Suddenly the general manager got his great idea. He left the car, and his astonished wife, while he ran into a diner to phone Charlie. Reports from Centerville said everything was cleaned up. But was it? A visit from the general manager might upset the routine and wouldn't really show anything. But suppose there were a new stock clerk, or timekeeper—his finger trembled as he dialed the home office number....

Monday afternoon, wearing old clothes and needing a shave, the general manager reported at the Centerville personnel office. Charlie had worked with his usual efficiency, after some pretty violent protests. (Maybe Charlie needed a rest.) "Joe Frederick" was being put on temporarily as toolroom clerk on the swing shift to replace a man who was ill.

It went well enough. The personnel man was polite, though he eyed the beard with distaste, and Joe was supplied with a booklet describing the safety program and suggestion plan. He didn't have to read it. He'd approved the page proofs six months ago.

Nice fellow on the day shift. Stuck around half an hour to break Joe in. Left only after the initial rush for tools by the new shift was over. About 7:15, MES 218 showed up to return a 7/16-in. straight-shank reamer. As he laid it on the counter, Joe noticed a fresh bandage across the back of his hand.

"What happened to your hand?"

"Nothing much. Skinned it a little adjusting the planer arm with a hand crank."

"Nurse fix it?"

"Nope."

"How come? I thought that—"

"Sure, I know," 218 laughed. "There won't be a week I don't get a scratch or two, Bud—that's why I keep a first-aid kit in my locker. Hell, there were four guys waiting for that job. I couldn't hold 'em up for a scratch."

"But the book," Joe argued, "says report any scratch."

"Sure, Bud. And if we did the company'd lose so much time we'd all be fired in a week. If it's serious I go to the nurse. If I'm not busy, I go to the nurse. When the blonde is on, sometimes I go anyway."

As Joe replaced the reamer in its rack he felt pretty good. Maybe the reports were right.

It was the next night, when he stopped for lunch at eight that he began to wonder. Joe was sitting on a valve-body casting outside the toolroom when MAR 1881—a lanky red-haired kid—sat down beside him. He was a lathe hand upstairs.

"How do you like it here?" the kid asked as he started on a thick sandwich.

"Okay." Joe was carefully noncommital. "You work upstairs, don't you?"

"Yeah, but I eat down here. I'd get a pain if I ate up there with Morey."

"Who's Morey?"

"Haven't you seen him yet? He's the boss upstairs. Wait till he wants something that's out. You'll meet him."

Joe didn't like this so well. He pursued the inquiry carefully, finding out everybody was on edge, finding out why.

"Fer instance," said the kid, "take the job I'm on now. There's a raft of welding-machine end bells that have been metallized inside. They're about the shape of large pipe caps, 6-in. diameter and two deep. They've got a close fit for a bearing roll inside. I had a setup on the job—kind of goofy, but it worked.

"How do you like it here?" the kid asked . . .

"I'd chuck the part in a special jig, put the lathe in reverse and use a straight toolholder to bore with. It's a shallow bore and by cocking the toolholder at an angle and setting the compound just right I was knocking 'em out fine.

"Along comes Morey. I guess running the lathe backward foxed him. He made me get a boring bar and set up the regular way. Well, the lathe runs frontward now, but it takes me twice as long and I can't see the cut I'm taking. See what I mean?"

Joe said he saw. After the lunch he sat in the toolroom dawdling at his desk. He saw himself starting out as an apprentice. And he remembered things he hadn't thought about for twenty years.

Later that same night MES 189 came over from his maintenance cage for some tools. 189 was a white-haired, quiet sort of fellow with the look of a real machinist about him. While he was waiting, a man from upstairs came up and laid a steam flange on the counter while he wrote out his ticket. As Joe came back with the tools, 189 was saying:

"This part of job 622, fella?"

"Yeah, why?"

"Those holes should be ¾ instead of ⅞."

"I think you're wrong. Let's see, I've got the sketch here." Sure enough, the holes on the sketch were marked ⅞.

"Look at the bottom," said 189. "It says 'over.' On the back it says notched flanges are identical with the original except bolt holes are ¾ in. rather than ⅞ in."

The man from upstairs looked at the notched flange and flushed. "Cripes, what'll I tell Morey? There's no extras."

"How many you done?" asked 189.

"A couple."

"Hey, Tony," called 189 to the downstairs foreman. "Can you give this fella an order to have a couple of flanges burned?" he asked, as Tony joined them. "Made a little error here."

Tony grinned up at the flushing workman. "Yeah, I see what happened," he said as he wrote out the order. "That's nothing. Here's your order. We'll charge it to tool and gear. Who'll ever check it?"

It was a few days later that Joe was getting some waste for the oiler when a safety man stepped up. "Say, Fred, where're your goggles? Ought to have 'em all the time."

"Left in my locker, Dan, I forgot. But I've got my regular specs."

"I see that," the safety man said, "but they don't give you much protection. Saw you grinding while ago. That's dangerous. Wish you'd get the goggles when you finish here."

When the safety man was gone, the oiler started to curse quietly. "What's the matter?" Joe asked. "He seemed reasonable enough."

"Oh, he's right about the goggles, but they burn me up messing with little things and letting the real stuff go."

"Such as?"

"Well, that sliding gate in the yard. I have to grease the line shaft across the top a couple of times a week. No catwalk, no handrail, no grab-irons. You just worm your way across forty feet of space. I pestered them for months, but it didn't do any good. It just gets everybody sore."

"Why don't they do something?"

"Politics—the company next door makes the gates and their offices look out over our yard. They give us a lot of contract jobs so we had to buy one of their gates. If we fix it up so it's safe, it makes them look pretty sick when they take a prospect to the window to show him the gate. They wouldn't like havin' to explain that making it safe makes it cost more than other gates. See what I mean?"

Two days before Christmas, Joe finally tangled with Morey. It was his last day on the job. He had some ideas for special tools that he wanted to leave behind him. While he was sketching them out, Morey came up to draw some carbide tools.

As he handed them over, Joe asked where he could find some suggestion blanks.

"What do you want those for?" asked Morey.

"Suggestions here in the toolroom. Even for the shop, maybe. Why?"

Morey leaned across the counter to shake his finger under Joe's nose. "Mind your own business, you old dodo," he bellowed. "Tony and me'll do the thinking around here. And don't you forget it."

"That's nothing. Here's your order."

"Mind your own business, you dodo!"

As Morey stalked away, Ray Holm, the man from the maintenance cage, came up. He and Joe had developed a quick friendship since the incident of the steam flange. He chuckled when Joe told him what had happened. "I thought I'd warned you about Morey, Joe. If you need something, make it yourself, or get one of the boys to help you. Don't let Morey or the front office find out about it."

"But what about the suggestion plan. It says in the booklet—"

"Sure, Joe. I know it by heart. Just the same you're a Wooden Indian to the front office. And they'd hate to have you make 'em think otherwise."

At quitting time, Joe turned in his badge and drew his pay. He walked towards the West End with Ray. Joe Frederick was almost dead. In a few minutes he would be the general manager again. But there was one more question he wanted to ask while he was Joe.

"Say, Ray. About that strike last spring. What was the real trouble?"

"I'll tell you, Joe. We fought about wages. But the real trouble is the little stuff you've seen. A man can't walk far with a pebble in his shoe. As long as things are like that, there'll be strikes and hard feelings."

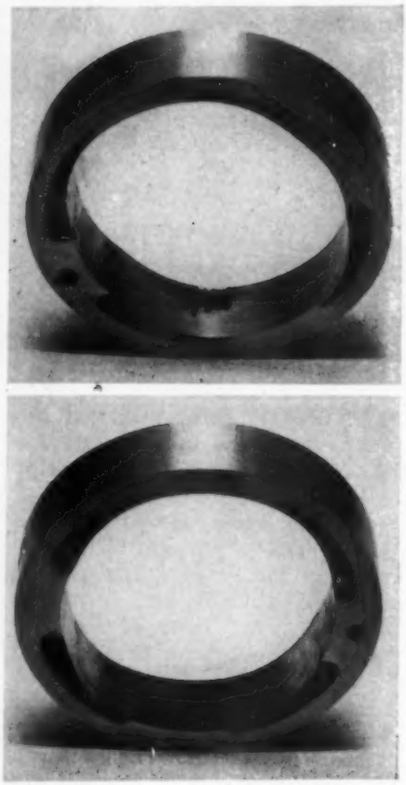
After they parted, Joe walked briskly. There was a feel of snow in the air. It was Christmas Eve, and the general manager felt better than he had in years. He'd been wrong. Joe Frederick wasn't dead. He hoped there would always be a little of Joe in him. If there was, maybe there would be a lot less labor trouble in Centerville after this—and in the other branches too.

And as he turned up the drive toward the lighted window with silhouette of a Christmas wreath, the general manager started to whistle.

What to Look for in Hydraulic Oils...IV

DEMULSIBILITY

Destruction of the hydraulic oil's lubricating value, sealant properties, and resistance to oxidation and emulsification occur from lack of demulsibility



***RUINED** while idle, this almost new pump ring was rusted by water (top) and corroded by build-up of acidic compounds (bottom) because the oil lacked demulsibility characteristics and hence did not wet out and adhere to the metal*

BY ANTHONY J. ZINO, JR.
LUBRICATION ENGINEER

CONDITIONS within the average hydraulic system are highly conducive to precipitation of moisture and formation of stable water-in-oil emulsions. Hence, a hydraulic fluid must possess ability: (1) to separate rapidly and completely from such contamination, and (2) to resist emulsification. This physical property of petroleum oil is known as its demulsibility characteristic.

Precipitation of moisture within the hydraulic circuit is directly caused by differences in temperature of fluid in the reservoir and the humid atmosphere above it, and by constant air leakage into the circuit. Presence of moisture or water in the hydraulic circuit can also be traced to a leaking oil cooler or to seepage of coolant arising from improper machine design.

Formation of stable water-in-oil emulsions is attributed to homogenizing action of the hydraulic pump on the water and oil mixture at the high pressures and fluid velocities which prevail.

Possible effects of both entrained or free water and of the "absorbed" water on life-expectancy of the fluid and service performance are:

1. Destruction of the Fluid's Lubricating Value
   (a) Increased frictional losses
   (b) Increased pump and valve wear
   (c) Increased packing troubles
2. Destruction of the Fluid's Sealant Properties
   (a) Increased pump and valve leakage
   (b) Erratic valve and pump operation
3. Increased Oil and Metal Chemical Activity
   (a) Destruction of the fluid's resistance to oxidation and emulsification
   (b) Promotion of rust and corrosion

The reasons for any or all of these failures of the hydraulic oil are:

Loss of Lubricating Value

The presence of water in a hydraulic fluid is a definite detriment to its lubricating value and is usually reflected in excessive pump and valve wear and high fluid temperatures. At the operating pressures and fluid velocities encountered in the usual hydraulic circuit, entrained water tends to scour the thin adsorbed oil film from the various operating surfaces and expose them to the effects of metal-to-metal contact. Under such conditions, the life of hydraulic valves and pumps (which depend upon the fluid for lubrication) cannot help but be seriously affected. Hydraulic packings, which depend upon the presence of a thin adsorbed oil film for efficient operation, can also be adversely affected.

Destruction of Sealant Properties

In time, water is detrimental to the oil's sealant properties, which are governed by its viscosity and surface tension characteristics. These characteristics are easily destroyed by moisture and water-in-oil emulsions. Surface tension is affected by oxidation of oil in the presence of water and metals, and by the build-up of acidic compounds. Resultant changes in the fluid's sealant properties adversely affect volumetric efficiency of hydraulic pumps and the efficiency of valves.

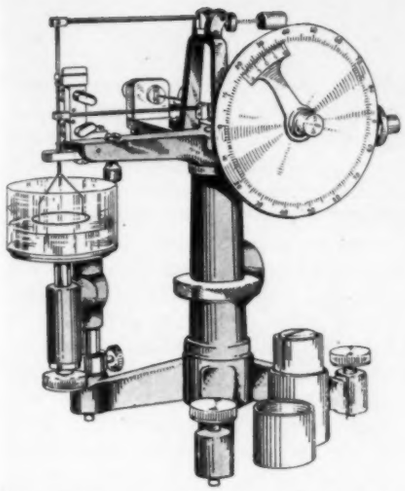
Increased Chemical Activity

The most serious objection to entrained water is the dual role it performs as a catalyst. Metals act by themselves to oxidize the oil. Water accelerates this process.

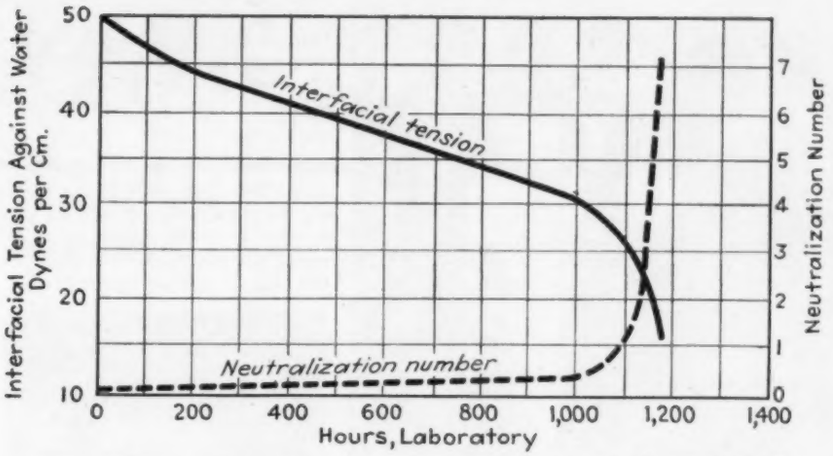
With increased oxidation, the acid content of the oil rises while the demulsibility characteristics decrease. Ultimate result is rapid emulsification of the oil in service and the precipitation of these emulsions throughout the circuit.

Surface-tension characteristics are also adversely affected or destroyed. Ability of the oil to absorb air is increased. Resultant problems are excessive foaming, aeration, chatter, noisy pumps and erratic hydraulic operation. Moreover, the life-expectancy of all subsequent charges of oil is drastically reduced by presence of these emulsions within the circuit.

After having accelerated the deterioration of the oil, entrained water assists in destruction of metals by increasing the chemical activity of the oil. The objectional results in



***INTERFACIAL TENSION** of hydraulic oil with respect to water is an important property, and is best measured at present with the du Nouy tensiometer*



***ACID CONTENT** and other contaminants increase with drop-off in the interfacial tension of highly refined hydraulic oil. Periodic du Nouy tests are required to avoid use of oil ready to sludge or form emulsions*

this second phase are electrolytic corrosion (pin-point corrosion) formation of metallic soaps and rust. The effects of these reactions will be given in greater detail in a subsequent instalment.

Evaluating Demulsibility

In evaluating the demulsibility characteristic of petroleum oils, primary interests lies in those compounds, whether organic or inorganic, which are hydrophilic in nature (possess strong affinity for water, and which hence have a direct influence on this important physical property.

Highly refined petroleum oils are composed of hydrocarbons which are basically hydrophobic (lacking in strong affinity for water), and contain (if any) an extremely small amount of hydrophilic compounds. Also petroleum oils oxidize in service to produce hydrophilic compounds such as organic acids and soaps.

With an increase in acid or soap content, the interfacial tension of the oil against water is decreased. Changes in interfacial tension can be measured accurately by the capillary or the ring methods.

Although not an A.S.T.M. standard test, the ring method, using the du Nouy interfacial tensiometer shows promise as a means of determining the "life-expectancy" of hydraulic oils. It is probably the only test available at this time that can be used on hydraulic fluids with any degree of accuracy.

In testing oils with the du Nouy interfacial tensiometer, a flamed platinum ring is lowered into a bath of distilled water which is maintained at a definite temperature. A sample of oil, at approximately the same temperature, is then poured into the water and allowed to spread out. Sufficient time is allowed for the two phases to reach equilibrium. The force then required to pull the ring through the interface, after correction for ring size and differences in densities of the phases, is recorded in dynes per centimeter.

Highly refined petroleum oils record interfacial tensions against water as high as 55 dynes per centimeter; average types of hydraulic oil, between 35 and 40 dynes per centimeter. Hydraulic oils are normally changed when their interfacial tension is approximately 15 dynes per centimeter. At this point, the organic acids and other contaminants have accumulated to such an extent that accelerated sludging of the oil as well as the formation of permanent water-in-oil emulsions may be expected.

An accompanying chart illustrates the value of the test and the gradual changes which take place in a hydraulic fluid's interfacial tension during a laboratory oxidation test.

The test commonly used to determine the ability of oil to separate from water is the A.S.T.M. Standard Method for Test for Steam Emulsion of Lubricating Oils (D157-36). In this test, steam is passed for 4 to 6½ min. through 20 c.c. of oil in a test tube until the volume of oil and condensate approximates 40 c.c. The time in seconds required for complete separation of the oil at 200 F. is known as the Steam Emulsion Number.

Although used extensively for evaluating turbine oils, the above test is extremely sensitive, particularly when applied to light oils (100 to 150 S.U.S. at 100 F.) In addition, as the viscosity of the oil increases, the test becomes less sensitive and more difficult to reproduce. Its value, as applied to hydraulic fluids, is questionable.

Recommendations

To prevent occurrence of problems attributed to the entrainment of water in a hydraulic fluid, or to minimize the effects of such water, several suggestions are offered:

1. Hydraulic oil reservoirs should be of sufficient capacity to allow for proper settling of water or water-in-oil emulsions. Baffle plates of proper size and welded to the bottom of such tanks are helpful. Facilities should be provided for periodically draining the settlings.

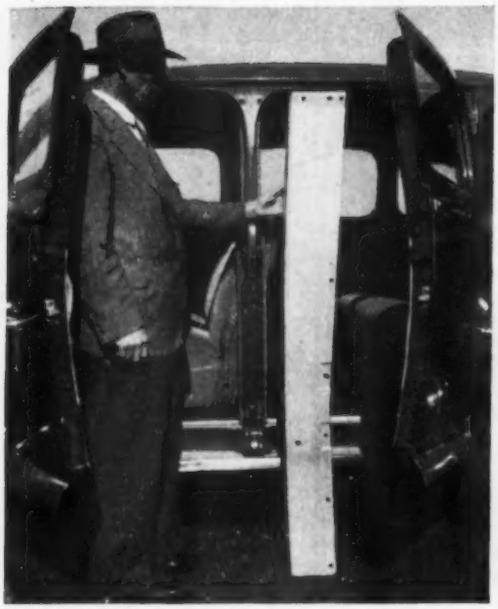
2. The intake line to the hydraulic pump should be at least 2 to 3 in. above the floor of the reservoir. It should be located at the furthermost point from the discharge line.

3. Efficient filters of proper size should be installed. The filtering element should in no way remove additives from the hydraulic oil. Filters should be periodically inspected, drained and cleaned.

4. The physical condition of the oil should be checked periodically, either visually or by laboratory methods. Interfacial tension tests are of great value at this point.

5. Hydraulic systems should be thoroughly flushed with very light hydraulic oil that has been processed with gum solvents after every drain period. This is particularly important after noticeable quantities of water or other types of impurities have been detected in the used oil.

Part V—Oxidation Stability will appear in an early number.



Running boards of sheet aluminum save substantial quantities of steel to be used in other places in the car. Weight saving is about half.

Air cleaner, made entirely from aluminum, not only saves steel but improves the design of the engine by reducing stresses imposed on the carburetor mounting by inertia of the part

Aluminum Replaces Steel in Ford Parts

Substitution saves 120 lb. of raw material on each car and frees enough to build 100,000 additional cars

BY CHESTER S. RICKER
DETROIT EDITOR

SUBSTITUTING sheet aluminum for steel in many Ford parts, and channelling the steel thus saved into other parts, would permit the production of up to 100,000 more automotive units a year, according to A. J. Browning, vice president, Ford Motor Co. At the present time, it is estimated that about 120 lb. of SAE 1010 sheet steel could be replaced by about 50 lb. of soft aluminum on each car. The weight ratio of steel to aluminum is three to one, but in some cases it would be necessary to use a heavier gage of aluminum to obtain the desired strength.

There are now 87 items on which substitution would be a possibility; 43 of these are either in production or are regarded as probable. These may be divided into three groups: (1) Those made from aluminum of the same gage as the steel and formed in the same dies. (2) Those made from heavier-gage aluminum, but still formable in the same dies. (3) Parts requiring a new process or new kinds of tools.

Most of the steel parts replaced are finished by painting, and in this respect no different treatment is required. Indeed, in many cases, the paint may be omitted on the aluminum parts. Other parts that have a polished metal finish, such as hub caps, are anodized for protection and are given a bright dip finish for satisfactory color match. Although they may be used only for service stock, they will save many tons of steel.

Oil-bath air cleaners are usually made from steel because of the relatively low cost of the material, but aluminum cleaners are actually superior since they weigh only 3 lb. as against 6 lb. for steel. The cleaner is usually mounted on top of the carburetor, and the inertia effects to which it is constantly subjected place severe stresses upon this. Aluminum reduces these stresses by 50%.

Changing the running boards to aluminum releases 20 lb. of steel. In this case, the gage of the stock must be increased, and the weight saving is only 2¼ to 1, but these boards will not rust and should have a substantially better life.

Headlamp housings are another unit in which aluminum has been substituted. These presented a problem because brackets must be fastened to them, and these in turn attached to the fenders. Tubular aluminum rivets have been found satisfactory for the purpose, and the total saving amounts to about 3 lb. of steel.

The Sealed Beam headlamp bulb is carried in an adjustable ring having a semicircular form rolled from strip and electrically butt-welded. This introduces electric welding into the substitution problem. Many other uses of aluminum might be made if the proper welding equipment were available, but this is lacking at the present time. Were it available, it might be possible to substitute aluminum for gasoline tanks and for rear deck doors where the lighter weight would be immediately evident to the user. Fenders and hood tops, however, require too much welding at present to even merit consideration in this program.

Substitutions are presently governed by these conditions.

(1) Are service stresses low in the part?

(2) Are parts as rigid as steel?

(3) When mounted like steel parts, will they stand fatigue as well as steel?

(4) If polished, will they color properly to match steel parts satisfactorily?

(5) Can riveting or crimping be substituted for welding?

Thus far, aluminum has been used satisfactorily to replace 22, 20, 18 and 16 gage steel parts, but there are certain physical differences which must be taken into consideration.

The elastic limit or yield point of steel is about five times that of aluminum. Hence, heavier-gage aluminum must be used, or the part made from it must not be highly stressed. Aluminum has only one-third to two-thirds the tensile strength of the steel, but if the design of the part is based on the yield point, this factor is of interest only as indicating the effort required to form it. With soft aluminum, which does not have springback, parts can be accurately formed more easily than from steel in dies formerly used for steel.

Elongation of steel and aluminum is given as about 25 to 40% for steel and 30% for aluminum, so ductility is about the same. This means that aluminum can be drawn about the same amount as steel in each step where multiple draws are necessary. Young's modulus of elasticity is a measure of the stiffness of the material. Here an interesting fact should be noted: Although aluminum has one-third the stiffness of steel, its stiffness per pound is the same, since it is only one-third as heavy as steel. By pound - for - pound replacement, therefore, an aluminum substitute could be made just as stiff as the steel piece it replaces.

TALKING SHOP

Showrooms

Several machine-tool builders are seizing the current opportunity (cheap money and leftover Machine Tool Show booths) to set up permanent displays in their plants. Such a showroom serves both the sales department and the employees who want to see the ultimate product for which they're making a part. In addition, it gives visitors something to do—and learn—while they wait.

We never will forget the look of pure rapture on the face of a wartime night riveter on wing leading edges after he'd had a chance actually to sit in his company's product —a very fast fighter he'd never before seen assembled. A showroom can do some of that morale building.

Mono-Bilt

New Hudson bodies have a radically changed structural design, with body and frame integral and attached to the engine frame. The rear frame is a U with open end forward. Rear-wheel tread is cut to 55 in. so wheels go inside the U, allowing a lower body. The separate engine-frame subassembly is bolted together, then welded to cross-members at the U-mouth. The engine is set behind the front knee-action cross-member and connected to the differential through three universal joints.

Frame side rails, incidentally, are box-section girders made up by spot-welding an elongated W inside an inverted L, leaving a welded flange at the top of one side, and at one side of the bottom. Cross-members are "hat" sections spotwelded to a strip to form a box with lower flanges. These provide the "lowered silhouette," with a "step-down" body less than 5 ft. over the road.

Ideas Reborn

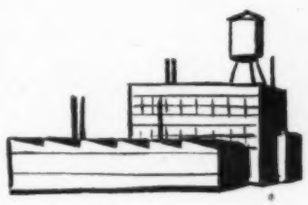
Two months ago, Ching-Fu Chen of Chungking, China, described a method of making hourglass worms on a lathe. Fred Colvin described the same method in our pages for Mar. 25, 1897. At that time it was called the Hindley worm. Ralph Flanders later showed the same method in his book on gearing and the Albro-Chem Elevator Co., Philadelphia, used it in elevators. Just shows that good ideas have a way of being reborn as needed. The idea, incidentally was a prize winner to our present readers.

Honor at Home

Norton Company recently set up its Machine Tool Show booth in its home plant, invited workers and townspeople to come in and see it. They had 4000 in two days. There is a very sound idea here.

Too frequently, all the sales effort is expended in impressing customers and prospects, little or noné on employees and local people. An occasional open house can do much more than any amount of other "employee relations" to make men understand why their work is important, to keep their wives and children impressed with Dad and his ability (and to make them understand why he gets tired and crotchety at times), and to make local people realize how large a company looms in their town. It's an easy thing to stage, too, particularly with "salesminded" booths standing idle. Why shouldn't shop men and others have "pep talks" just as salesmen do? What good is honor abroad if you can't have it at home?

Incidentally, Norton provided booklets and souvenirs, and on an extra day, invited in customers who hadn't been able to get to the Show in Chicago.



Bromide

Our recent special report on drawing ultra-fine wire reminds us of a story we proudly published 20 years ago of the American firm that drew the finest wire in its history. Feeling a little inflated, the president mailed a sample ,sprung between posts on a little cast frame, to his major competitor, a Swiss outfit. In due course, the frame came back, with a shop microscope fastened on and focussed on one end of the strand. Assuming the Swiss were trying to pick small flaws, the president squinted through the scope—to see his finest wire neatly drilled to permit insertion of a wire less than half its diameter.

Good yarn—we even "knew" the outfit. But, through the years, we've become suspicious. It seems there was a Jap outfit that made a case of the finest American needle and put a still finer needle within, the German outfit that made a tube out of the finest drawn U. S. wire and ran a wire through it, etc. etc.

Makes a good story anyhow.

Down Goes Inventory

Hahn Motors, Inc., Hamburg, Pa., builds aluminum package-delivery bodies. Heavy-gage aluminum for sides and top makes unnecessary the ribs or stiffeners associated with sheet-steel construction, yet saves weight for a given strength. Only one type of extrusion is used for body corners to simplify inventory and "know-how," although nine different bending fixtures are needed to suit all requirements of the various bodies produced.

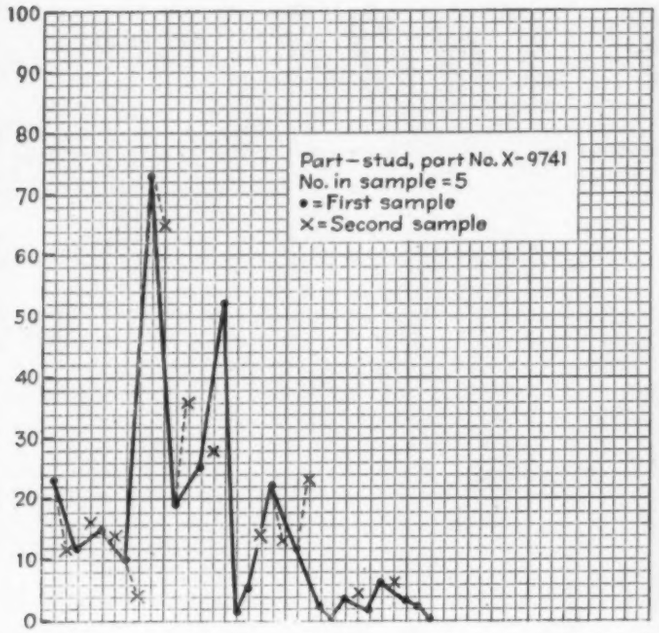


Fig. 1—A separate *P* chart is maintained in the receiving inspection department for each part-supplier combination on which statistical-quality-control procedures have been established. Where percent defective in first sample exceeds allowed value (see table), a second sample is taken and both values are plotted

$\bar{P}$-DATA SHEET
Part No. X-9741

No. Pieces Received	No. Pieces in Sample	No. Def.	% Def.	Oversize P. D.	Undersize P. D.	Oversize O. D.	Undersize O. D.	Too Great Lead Error
1650	100	23	23	19		4		
	200	24	12	19		5		
1500	100	12	12	10		2		
	200	33	16.5	15		18		
1500	100	15	15			15		
	200	28	14			28		
1500	100	10	10	4		6		
	200	9	4.5	8		1		
1350	100	73	73	71		2		
	200	130	65	129		1		
1250	100	19	19	17		2		
	200	73	36	72		1		
1500	100	25	25	22	3			
	200	56	28	42	1	13		
1200	100	52	52	52				
	200							
1500	100	1	1	1				
11,950	200	11	5.5	10%		1		
	400	59	14.7	57		2		
9100	200	44	22			44		
	400	54	13.5	10		42	2	
7050	150	18	12	3		15		
	300	68	23	44	4	20		
6950	150	3	2			3		
	300							
6725	150	0	0					
						7		
27,275	200	7	3.5					
	400	19	4.7	2	1	16		

Fig. 2—$\bar{P}$ data sheet for the chart shown in Fig. 1 records number of pieces in each sample, number defective in each sample and percent defective for each inspection operation. Also tabulated are quantity of parts found defective for each of several causes, including oversize and undersize on pitch and outside diameters, as well as lead error

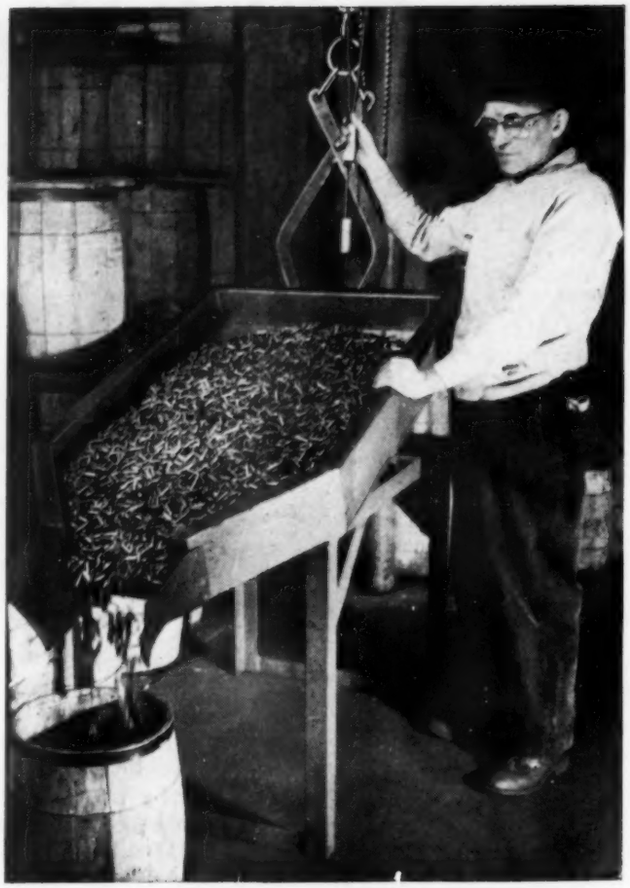


Fig. 3—Selection of random samples from parts packed in kegs or boxes usually is a desired rather than an actual condition. A special sampling table allows dumping a whole load, selecting samples and returning parts to their container by raising one end of the table with a hoist

Purchased-Part Quality Controlled

Statistical methods, applied to inspection of incoming parts, prevent defective parts from reaching assembly lines, lower production costs and delays

BY ERNEST L. FAY
Chief Inspector
JOHN DEERE TRACTOR CO.

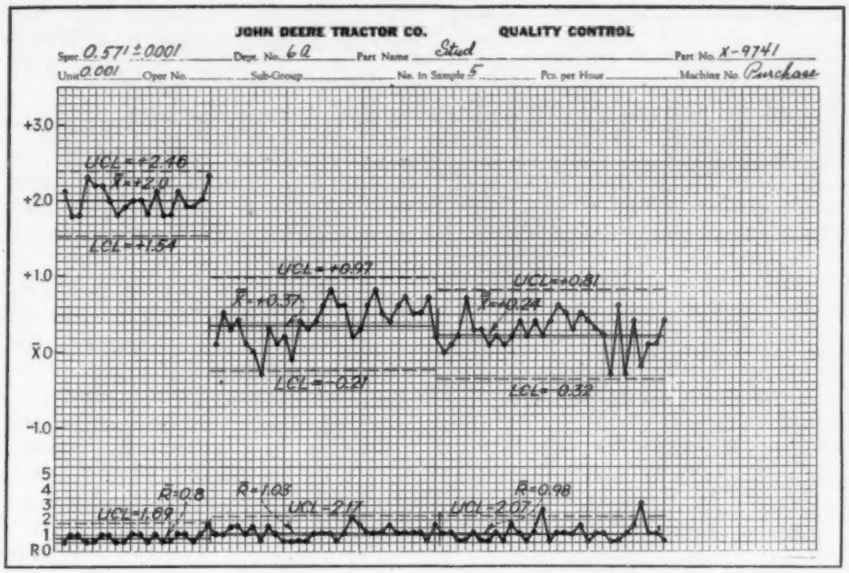


Fig. 4—$\overline{X}$ and R charts were started when the $\overline{P}$ chart (Fig. 1) showed the vendor to be out of control. Prepared especially to illustrate the complaint to the vendor on the type of defects being found, these charts show quick improvement in quality following corrective measures taken by the vendor

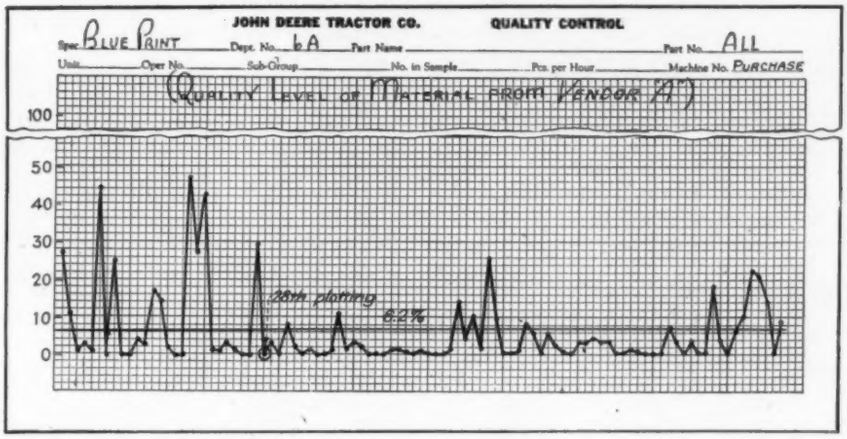


Fig. 5—Quality-level $\overline{P}$ charts are maintained for each vendor and cover all parts received from the same source. While improvement can be noted beginning with the 28th plotting, this supplier's average quality level was not too good during the time covered by the chart

Extensive application of statistical quality control to production operation inspection in the John Deere Tractor Company (see *Common-Sense Quality Control, Parts 1* and *2*, published earlier this year) has naturally led to its gradual application to checking of incoming parts.

Results achieved to date have been so worth while that these controls are being expanded as rapidly as possible to cover virtually all purchased parts and material.

Because parts received in large quantities constitute a major receiving inspection problem, statistical-control methods are being applied first to such parts. When old inspection practices were followed in checking such parts, including 100% inspection, it was difficult to provide adequate inspection coverage to many parts.

As a result, unsatisfactory parts often reached assembly lines, with consequent increase in production cost. Also, accompanying delays made it difficult to hold production schedules to the desired level.

On items now under statistical control we are experiencing little difficulty. In the near future we expect to have all the material passing through our receiving inspection department placed under statistical control.

Control procedures followed in the receiving inspection department are similar to those employed in the production department, except that $\overline{P}$ (percent defective) charts are maintained for each part received from each supplier until these charts show that some of a supplier's product is out of control. Then $\overline{X}$ and R (average and range) charts are developed for those parts so the purchasing department will be able to consult intelligently with the supplier in discussing defects.

For example, Fig. 1 shows a $\overline{P}$ chart for studs received in fairly large quantities from a certain vendor. The chart is plotted from data tabulated on a report sheet (Fig. 2) which shows the number of defects found in each sample, the percent defective and the quantity of parts found defective for each reason.

The size of each sample was determined from a standard receiving inspection table based on Army Ordnance tables. Where the number of defects found in a given sample exceeds that allowed in the table, a second sample is inspected. Results of second sampling are charted.

Random Sample Taken

Every effort is made to take a representative random sample from each sub-lot checked in the receiving inspection department. Each keg, box or container of parts is considered a sub-lot, and the required number of sample parts is selected at random from that sub-lot.

To simplify checking such random samples, we have developed a special sampling table (Fig. 3) into which each sub-lot is dumped before samples are taken. A small electric hoist with keg tongs is provided at this table so the inspector easily can dump the sub-lot for checking. When he has selected and checked his samples, the inspector then dumps the sub-lot back into its container by lifting the back end of the table with the hoist.

Originally, random samples were obtained merely by opening the top of the container and pushing the hands into the mass as far as the inspector thought necessary—and this usually was not very far. The result, of course, was not a true random sample such as we know obtain with our sampling table.

When a $\overline{P}$ chart shows the part being checked as out of control, as in Fig. 1, $\overline{X}$ and R charts (Fig. 4) are prepared. The first section of these charts shows the conditions existing at the time the first complaint was entered with the supplier.

The next two sections illustrate what happened to the quality of incoming parts after the supplier had

JOHN DEERE TRACTOR CO. QUALITY CONTROL

$\bar{X}$ - R DATA SHEET

SHEET No. 1 PART NAME VENDOR "A" PART No. _____

SPEC _____ OPERATION No. _____ MACH. No. _____

No. IN SAMPLE _____ SUB. GROUP _____ UNIT _____ PCS. PER HR. _____ DEPT. No. _____

NO.	NO. PCS. CHECKED	NO. DEFECTIVE	% DEFECTIVE	REASON FOR REJECT
1	225	62	27.5	4-5-46
2	225	26	11.5	
3	75	1	1.3	4-8
4	150	5	3.3	4-10
5	200	2	1.0	4-12
6	300	133	44.5	4-15
7	100	0	0	
8	300	76	25.3	4-17
9	150	0	0	4-18

Fig. 6—Quality level of parts received from each vendor are recorded on data sheets before being plotted on $\bar{P}$ charts. These data show erratic quality

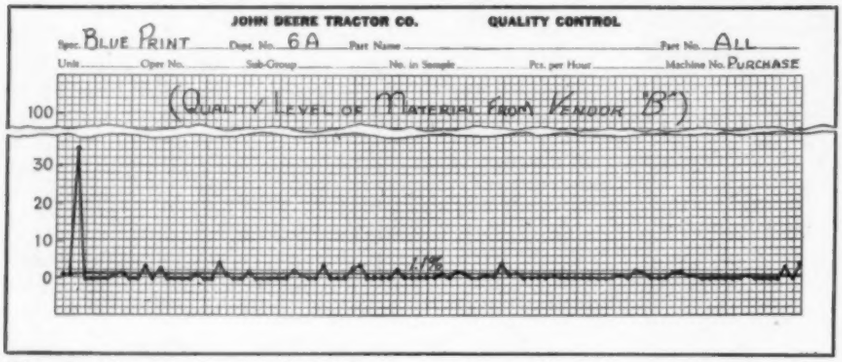

JOHN DEERE TRACTOR CO. QUALITY CONTROL
Spec. BLUE PRINT Dept. No. 6A Part Name Part No. ALL
Unit Oper No. Sub-Group No. in Sample Pcs. per Hour Machine No. PURCHASE
(QUALITY LEVEL OF MATERIAL FROM VENDOR "B")
100
30
20
10
0
1.1%

Fig. 7—Average percent defective for parts received from vendor B from April 5, 1946, to and including Jan. 27, 1947, was only 1.1%, with high consistency. Products received from this supplier can be expected to be in control

Sample Sizes For Quality Control in Receiving Inspection

Based on Army Ordnance Tables with Acceptable Quality Level of 1.1 to 2.0%

Use each keg, box or container as a sub-lot.

Sub-lot Size	500-799	800-1299	1300-3199	3200-7999	8000-21999
First Sample Size	50	75	100	150	200
No. of Defects Allowed	2	3	3	5	6
	If more than (2) defects, select another sample	If more than (3) defects, select another sample	If more than (3) defects, select another sample	If more than (5) defects, select another sample	If more than (6) defects, select another sample
Second Sample Size	100	150	200	300	400
No. of Defects Allowed in *both* samples	4	5	8	13	16
	If more than (4) defects in both samples, 100% inspect or reject sub-lot	If more than (5) defects in both samples, 100% inspect or reject sub-lot	If more than (8) defects in both samples, 100% inspect or reject sub-lot	If more than (13) defects in both samples, 100% inspect or reject sub-lot	If more than (16) defects in both samples, 100% inspect or reject sub-lot

Use a $\bar{P}$ chart in conjunction with the above. On this chart, in black pencil, record the findings of the sub-lot of first sample. If second sample is necessary, record results in green pencil. If 100% inspection is taken, record findings in red pencil. On data sheet, show reason for rejects, also findings in 100% as to total pieces, inspection, number of defects and reason.

taken corrective measures. This improved condition also is reflected in the later portions of the $\bar{P}$ chart (Fig. 1).

Experience has shown that maintenance of $\bar{X}$ and R charts is necessary only as long as the supplier is having difficulty meeting required tolerances. It can be discontinued when the part is under control.

At the same time that $\bar{P}$ charts are being kept for each part received from each supplier, a quality-level chart is maintained for each supplier. This is another percent defective chart (Fig. 5) and gives the inspection and purchasing departments an opportunty to check the average quality level of each supplier from whom material and parts are purchased. These charts are plotted from data sheets (Fig. 6) on which the record of each inspection of parts received from vendors is recorded at the same time that it is recorded on the similar data sheet covering a particular part.

Quality Level Charted

The quality-level chart (Fig. 5) for material received from vendor A covers all items received from that vendor from April 5, 1946, to and including January 27, 1947. It will be noted that this vendor has an average of 6.2% defective for the entire period and that some improvement can be noted beginning with the 28th plotting. Difficulties, however, still can be expected with parts received from this source.

On the other hand, the chart for the same period of time for material received from vendor B (Fig. 7) shows an average of 1.1% defective with only one bad point, and that at the beginning of the chart Experience thus indicates that parts received from vendor B ordinarily require little more than a minimum of sampling inspection.

With millions of small parts passing through our receiving inspection department each year, the quality level of each supplier can be important information. It shows where inspection must be concentrated to insure a high level of quality for parts delivered to assembly.

As experience is gained in application of statistical methods to the control of quality in our receiving inspection department, we expect to develop new controls that will give us further assurance of quality for parts accepted for delivery to the shop. The result will be lower inspection cost, better product quality and better relations with suppliers.

Welding—Island Style

By Mac Diogenes

WHEN the twentieth century was still very young, Matt A. Nanias had completed his apprenticeship in an engine-building shop, and took a berth on a decrepit and weather-beaten tramp steamer as assistant engineer.

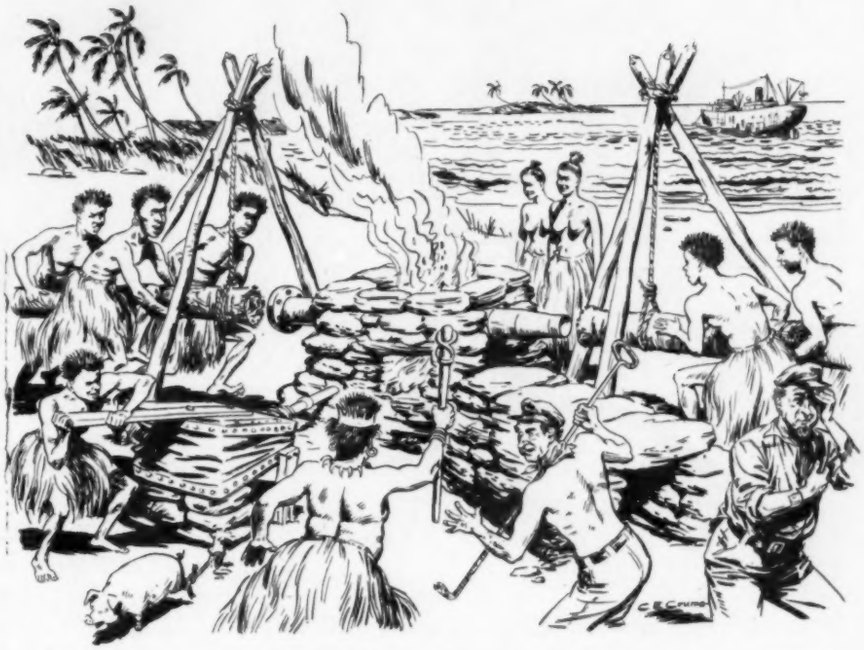
After months of haphazard travel the old tub somehow made the South Pacific, and a visit to the drydock was long overdue. Matt claims that only force of habit kept the engine's moving parts together. Two days after leaving Nauru with a cargo of crushed and dried rock phosphate, bound for Sydney, fate caught up in the shape of a broken tailshaft.

Now, if the engine room crew could only make repairs to take their craft into port there would be a big bonus for all. Matt and the Chief thought it would be worth trying for. The Captain did his part: rigged a makeshift sail and made for an island with a sheltered lagoon. Smart seamanship took them through a passage in the reef and into calm anchorage. The cargo was trimmed to lower the bow and raise the stern sufficiently to take out the broken tailshaft.

Preparations were made on the island for the welding job, a fire pit built with an attached wind tunnel leading under, the opening of the tunnel being towards the prevailing trade winds. Fire bars from the ship were used, also what fireclay they had plus cement and native rocks.

It was no great job for the old-time crew to get the shaft in position. The Chief closed one eye, sighted along one side, then the other eye for the reverse side, and cautioned the ship's firemen to be careful when poking the fire, which was soon built up and lit. Meantime, Matt had been busy with the ship's carpenter, fabricating a big bellows of wood and oiled canvas with inlet and outlet flap valves of thin leather.

After the fire had been going with a nice wind for a day and night, the bellows—a two-man implement—was put to use for a few hours and the Chief decided the heat was about right. It was here that the Island King and his trained troupe of natives came into action with the battering rams suspended from tripod supports the ship's crew had erected. The rams were about the size of small telephone poles. The King, who talked pidgin English fluently, ("Plenty too much good," in his own words), had insisted on acting as prompter on the job.



"Plenty too much good," said the King—and the forge weld was started

After some sand and borax had been thrown on the broken hot ends, our Chief signalled O.K. to the King, who started the chorus, the battering rams were pulled back and then slammed on the two ends of the tailshaft like one blow.

After a few cracks it was decided to take a look—the weld had taken. Of course, there was considerable swelling at the position of the weld and Paul Bunyan himself couldn't have got close enough to that hot shaft and fire to swing a sledge. It was here that Matt and the Chief proved their foresight and planning genius. Two teams of rehearsed picked native marksmen took up the job at piles of rocks previously gathered and placed, and pummeled the weld from comfortable pitching distance while the shaft was levered around by natives with long tongs clamped in the flange-bolt holes.

It was found necessary then just to shift position of a battering ram to give the shaft a litle tap on the high side to take out the almost inconsequential departure from straightness. The Chief pronounced the job, after the eye test, as good enough to run a Kirkintilloch Canal liner.

Did Matt get his big expected bonus? Well—no. Repeated moving of the cargo made trouble: the dust had worked into the engine eccentrics, one of which got so hot after getting under way that it was necessary to stop the engines one night so the strap could be taken off, cleaned and scraped. Matt claims he was just finishing up and ready to tighten the last nut when the ship struck a reef. He got off in one of the boats with nothing in his pockets but a feeler gage, which he shows as proof of the story. It was an old-timer, with blades that had tapering edges, and the 0.025-in. blade rounded badly at the point, Matt claimed, from opening and reaming holes on so many milk coconuts. Some of the boys claim the juice must have affected him.

ROUND TABLE

Step Down or Step Out?

"Say, Al, that new assistant foreman will be top man on the millers if Mike Conrad doesn't spend more time on his job. Haven't seen Mike around since yesterday."

"Didn't you hear? They knocked Mike down pay day. Sent him out to my place as a trouble shooter, Ed. Back working by the hour, too. I don't like it, having a guy who used to be a foreman working by the clock again. Seems to me, the company ought to be more careful. Conrad's going to give me some grief."

"Oh, I don't know. Old Mike's served the company plenty long. Just because he can't keep on top any more doesn't mean he shouldn't be kept working at something. You sound kinda' tough to me. Get the best years from a fellow, then let him go. How'd you like to be treated that way?"

"I don't mean to be cold-blooded, Ed. It's just that Mike, or anybody in the same fix, will never understand why he's been demoted. Such fellows always carry a grudge against the company, always ready to argue their case. Mike may have known something about bossing a bunch of milling machines, but I don't want him. He'll only upset the rest of my men."

"You sound like you're scared of takin' him on. I'll begin to think that you're going to be upset, not the men. Why don't you forget who he used to be and take him for what he's worth to you? Mike ain't rich and he's gotta' work some place."

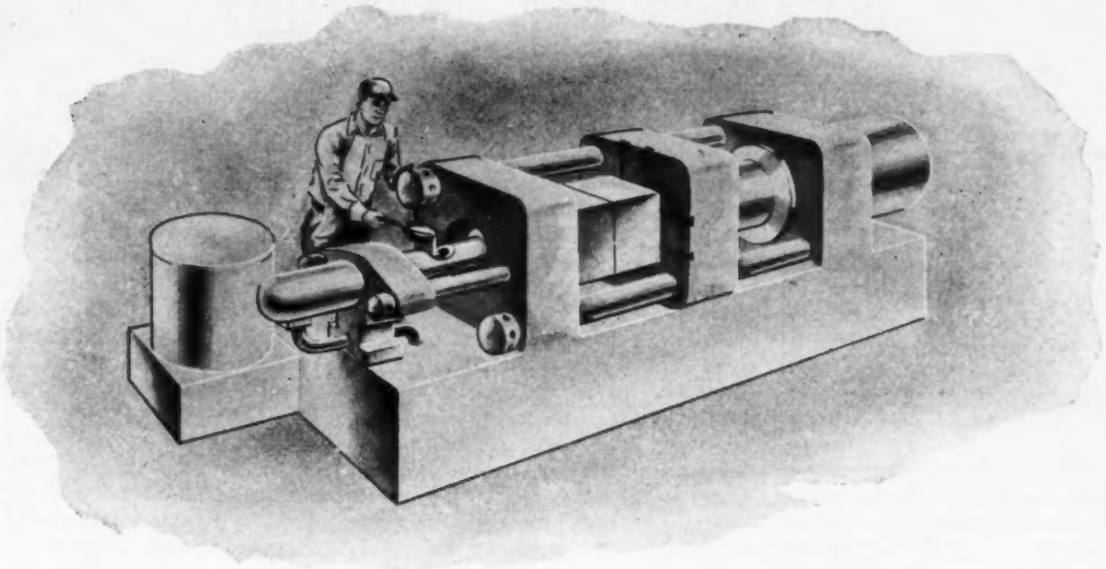
"Hell, Ed, you don't get what I'm driving at, at all. Mike is going to lose face, not only for himself, but for all the rest of the foremen. What'll the men say? Much better to get out of the company altogether, take another job somewhere else, or better yet for a guy who's been around as long as Conrad, retire. That would leave a better feeling all around and give the new foreman a chance to run the job the way he wants to."

"Wait a minute. What's all this retirement talk? You know, Al, our outfit isn't big enough for a 'cradle to the grave' program. Any foreman who's worked as hard and as long for us as Mike Conrad at least deserves a life job of some sort. Mike hasn't got a pension, but he oughta' have a job."

"But I don't see why I have to take someone who's outworn his usefulness, or why the company has to worry about someone who didn't think about his future or age when he had a good job. When I start getting in the way around here, I expect to . . ."

***THIS PROBLEM** has put more than one plant manager in the sweatbox. What can be done with management men when age takes its toll?*

Your ideas or suggestions will help others. Discussions of earlier topics appear on later pages.



How To Make
DIE CASTINGS

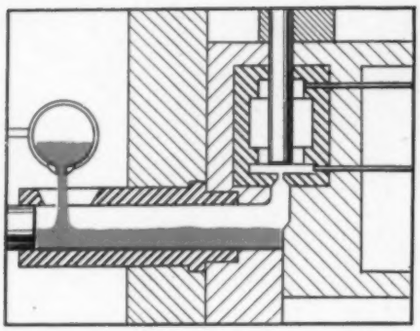
BY JAMES VAN VOAST, ASSOCIATE EDITOR

Despite the ever-accelerating increase in the production of die castings during the past generation, misconceptions have prejudiced producer and customer alike until recently. The tremendous demand for die castings has not abated since the war, and this impetus has caused a change in thinking. Good work in the past was the result of slow and costly cut-and-try experimenting, beyond the economic capacity of all but a few. Now, sound, smooth castings are the rule rather than the exception, and the high-quality casting has proved the cheapest casting from every angle.

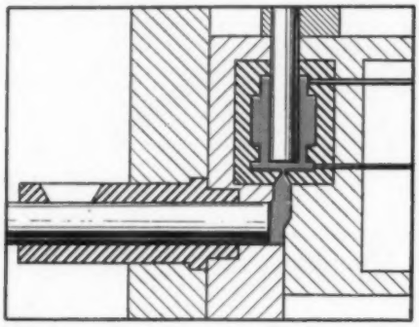
A new cooperation between foundryman, scientist and engineer gets the credit for the change, wherein pet ideas based on experience are combined with the tools of mathematical science to produce the first real progress in the art since 1930. This report, with data collected from casters, machine builders, metal producers, designers and users, explains the fundamentals of modern die-casting techniques by which today's results are achieved.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

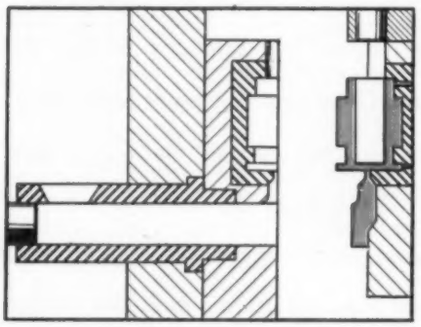
WHAT IS DIE CASTING?



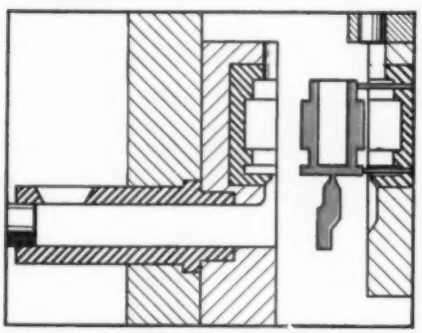
1 Hot metal is ladled into injection cylinder as soon as die is locked and all moving cores are in position



2 Hydraulic pressure drives injection plunger, pushing metal through sprue and gate until the die cavity is filled



3 Dwell time and high pressure allows casting to freeze solidly, then die opens and moving elements all retract



4 Ejector pins push casting from die completing the cycle. This sequence is flexible depending upon many factors

DIE CASTING is the metalworking process by which molten metal is formed under pressure into practically finished parts of considerable complexity in a rapidly recurring cycle with a minimum of hand labor.

A die, consisting of two halves, plus cores and other moving parts to shape the inside and outside of the desired part, is placed in a powerful press, and when all the components are securely locked in position, liquid metal is injected at high speed and under high pressure into the die cavity. The machine, consisting of the press and the injection mechanism, is designed for speed so the cycle of operations resulting in a casting can be as brief as possible. The die halves are bolted to opposing platens of the press in perfect register, and usually, the other moving parts are integrated with the press in such a manner that they will operate automatically in proper sequence as the press opens and closes. On most machines, the operator's only duties are to start each cycle by pushing a button, and to remove and inspect each casting and the die cavity after every shot. Metal temperature (in the furnace), die temperature, oil pressure (for the hydraulic cylinders) and dwell time are regulated automatically and require only occasional checking.

A Production Operation

Dies cost a lot, machines are expensive and setting up and getting into operation is often tedious and slow, but once everything is functioning properly, identical castings emerge at rates up to ten a minute, regardless of part size or complexity. When a small part is to be cast in large quantities, it is often practical to make a multiple-cavity die, capable of producing as many as a dozen or so parts per shot.

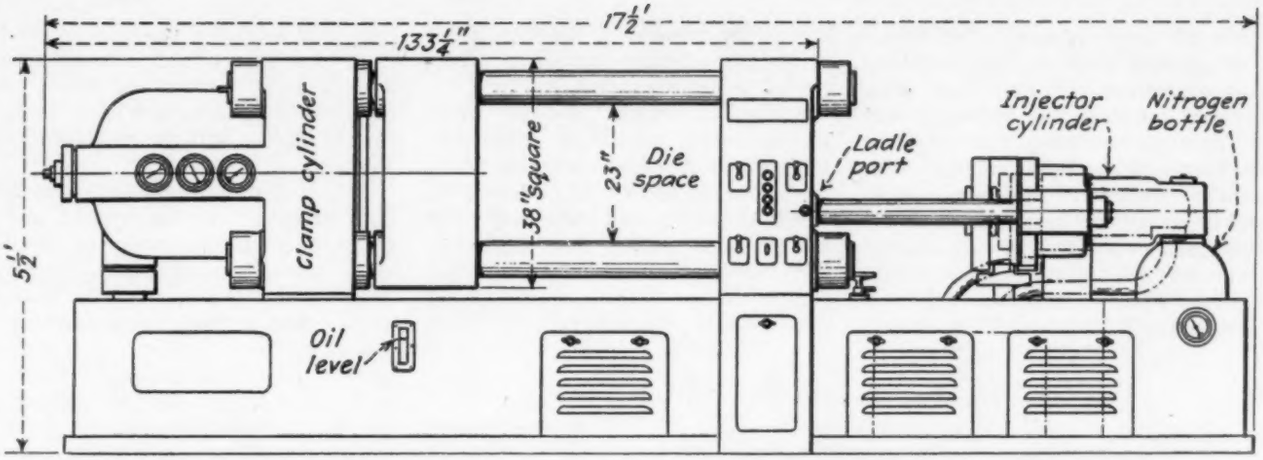
The piece of solidified metal which the operator takes off the ejector pins with an asbestos-gloved hand is called "a gate." About 50% of this metal is sprue, runners, gates proper, and flash and must be removed (and remelted). Often, as he inspects the shot, he will break off most of the surplus and toss it into the crucible and then put the rest of the casting on a conveyor. Flash is the thin sheet of metal that shoots out along the parting surface between the die halves. Rather than attempt to prevent flash, it is tolerated as a convenient means of venting the air from the cavity and later trimmed in a blanking operation in a punch press. This may be the only finishing operation, but usually there will be some minor machining, and possibly buffing and painting or electroplating.

Terminology is not standard. In America, "die casting" means pressure-injected metal and permanent dies. In England, it includes gravity pouring, known as permanent-mold castings in the U.S. But a new term has come into somewhat limited use in the U.S. "High-pressure die casting" is sometimes used to advertise the top-quality work, but there is no basic difference in the process.

Quality Is Here

Standardization is growing steadily. ASTM specifications cover most aspects of the process and constitute a good basis for mutal understanding between caster and customer. Other factors, such as quality of surface finish, are still a long way from standardization, and a few plants are producing castings of a quality that is nearly incredible to many of the others. But the exceptionally good work of ten years ago is now practically universal and the old reasons for customer complaints and objections have been eliminated.

Casting quality, at one time a serious limitation of the process in general, is now completely controllable, and surface finish- and mechanical properties of all kinds can equal or better the results of any other method, and without loss of production speed or rejects. Zinc alloys permit the faster speeds and lower costs because of the lower melting point and casting temperature, and for average work (including structural parts) they are absolutely reliable. Aluminum is second in importance, with magnesium, brass, tin and lead figuring in approximately that order. Iron die castings have been made, but on a very limited and experimental scale. (The higher the casting temperature, the more difficult and expensive the work becomes because of thermally created stresses and accelerated oxidation and chemical action.)



PROPORTIONS of this 400-ton hydraulic cold-chamber machine are typical modern practice. It will "shoot" up to 100 cu.in. of aluminum, brass or magnesium at pressures up to 50,000 psi. and adjustable speeds up to 7200 ipm. Permissible projected cavity area (low pressure) is 126 sq. in. with a total available die space of 23 x 38 in., and a maximum clamping force of 400 tons. It has a maximum daylight opening of 42 in. and 16 in. of clamp travel. Maximum clamp ram speeds is 400 ipm.

HOW DIE-CASTING MACHINES WORK

INJECTION SYSTEMS are of two principal types: *Submerged-plunger* injection is used for all low-melting-point alloys where erosion and corrosion of the machine parts is not serious. With this method, sometimes called the gooseneck method, a cylinder and plunger is permanently submerged in the pot of molten alloy. The injection plunger is connected to an air or hydraulic cylinder above or to one side of the pot, and the injection-cylinder casting has a passage which rises from the pot to convey the metal to the sprue of the die. When the piston is fully retracted, ports in the cylinder admit liquid metal which then fills the cylinder by gravity. On its down stroke, the injection plunger first closes the ports, then begins to push the metal through the passage up to the die. The injector unit must be selected with sufficient capacity to fill any die cavity likely to be used.

Air injection is much the same except that air pressure is applied directly on the molten metal in the gooseneck, eliminating the piston. This type is still used for aluminum work (where contact with iron must be minimized) but is now considered obsolete.

Cold-chamber injection is required, despite its inherent slowness, with all higher-melting-point alloys. The gooseneck is eliminated and the cylinder and plunger are placed as close to the sprue opening as possible. Metal is hand-ladled in precise amounts through a filling port and the shot follows quickly so the injector is not heated and the metal is not cooled appreciably, and iron pickup (alloy contamination) and injector-corrosion are as low as possible. Even so, the plunger tip and the nozzle are nitrided for longer life. This method implies higher pressures and injection speeds than customary with gooseneck zinc machines.

Accumulators are frequently applied to both submerged-plunger and cold-chamber machines to gain highest injection speed with a minimum of hydraulic pump and piping capacity. As the injection process is intermittent, a hydraulic pressure tank can be filled at a steady rate which will at least equal the intermittent high rate of discharge. This cuts down on the amount of piping required and eases the load on the pump.

Sometimes the accumulator is just a bottle of nitrogen gas, sometimes a large cylinder arranged to take oil pressure and gas pressure on opposite sides of its piston, and sometimes a cylinder and piston backed with a heavy helical spring. With the gas-oil accumulators, a stepped piston is sometimes furnished so low gas pressure operating over large piston area will maintain high oil pressure.

The fire hazard with a furnace—hot metal and high-pressure oil—requires every possible precaution. Air accumulators have been used, and plants have blown up, too. Some machines have inverted injection cylinders so gland leakage can't drip directly into the pot. Others have all hydraulic equipment entirely below furnace level, operating the injector through a rocker arm and linkage.

Clamping Methods

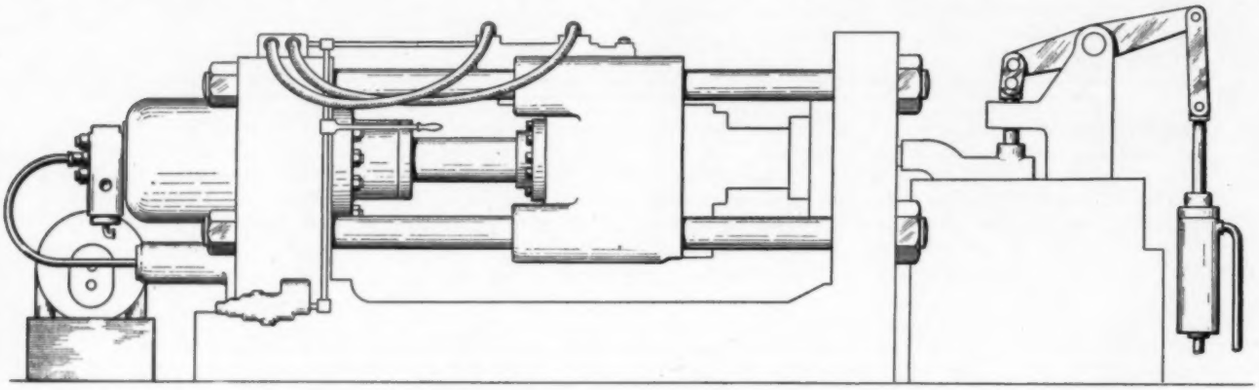
Toggles, actuated by hand, air, oil or an electric motor are the accepted standby, because of their low first cost and simplicity. The press consists of a fixed platen, a sliding platen or crosshead, an adjustable platen, and another fixed platen, all connected by tie bars. The sliding platen and the adjustable platen are connected with suitable links and pins to open and close the die. Clamping pressure is based on the stress due to stretch in the tie rods, which is equivalent to the amount of overlap imposed on the toggles.

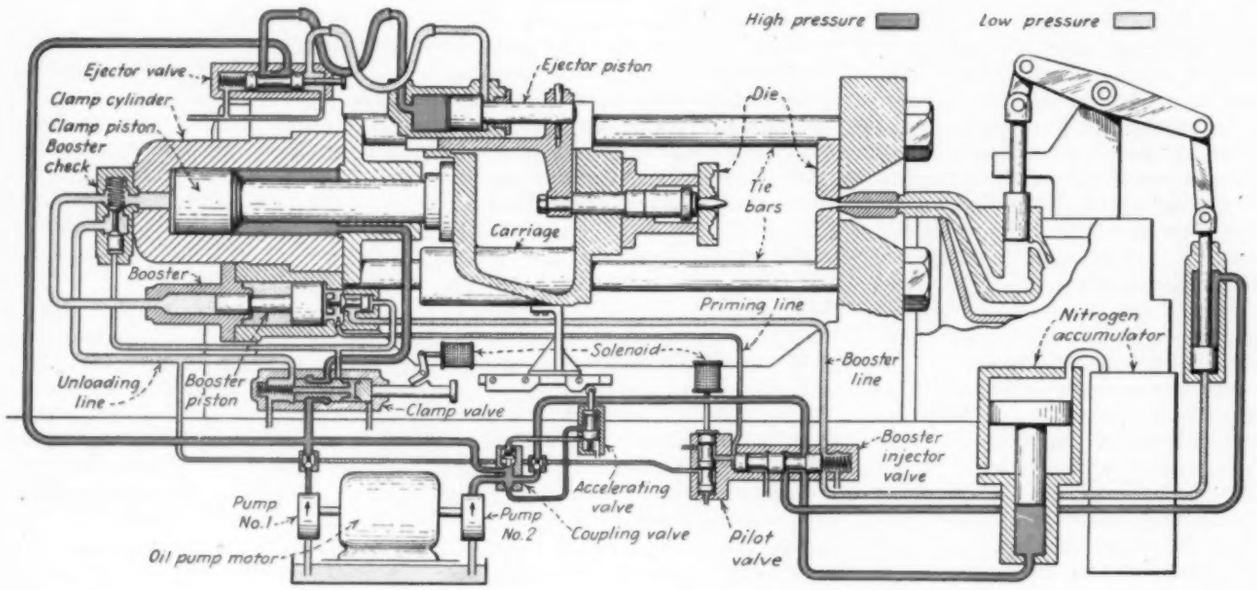
As every die is a little different, and die changes, especially in jobbing work, are frequent, provision must be made for adjusting the locked-toggle position to suit the different die heights. Some machines are adjusted by turning a nut on each of the four tension bars, and sometimes these are synchronized. Sometimes the adjustable platen is moved by a single, centered screw to eliminate the chance for misalignment when four nuts are involved. In any case, the adjust-

ment is very delicate. Too much overlap will slam the die together and overstress the links and pins, causing bending and breakage and die damage. Not enough overlap and the dies will not hold the shot; flash will be excessive, dies may warp. and accuracy will be sacrificed. Damaged pins, when they occur, usually mean wrenching and distortion, and repaired parts seldom last very long. The toggle linkage requires careful lubrication because of the high pressures, and sticking can occur when the oil is squeezed out.

Straight-hydraulic clamps seem better suited to larger machines. Mechanism is eliminated, the moving platen being attached directly to the hydraulic piston. Oil flow need not be much greater than with corresponding hydraulically actuated toggle clamps because the opening and closing strokes require little force and a small piston can be used. High clamping pressure is obtained with any of several booster systems which build up and hold the die closing force with a minimum of pumping.

Adjustment is eliminated because high pressure can be applied anywhere in the piston stroke, or whenever opposition is met. Factors affecting clamp operation are: maximum clamping force (dependent up-





TWO-PUMP SEMI-AUTOMATIC TOGGLELESS ALL-HYDRAULIC ZINC MACHINE CYCLE

Operation is initiated with the hand lever. This actuates the clamp valve, allowing pressure oil from the plain gear pump No. 1 to flow to the head end of the clamp piston. Carriage movement immediately depresses the accelerating valve by means of the attached cam, allowing differential pressure (coming from No. 2 pump) to act on the stepped piston in the coupling valve and cut off the connection between the two pumps. Carriage movement, interlocked with the hand-lever linkage, shifts the ejector-valve piston, allowing oil to retract the ejector pins. Further clamp and carriage travel allow the accelerating valve to rise again, reconnecting the two pumps for combined action on the clamp piston, traversing it at high speed until the cam again depresses the accelerating valve, cutting off the second pump and slowing down the clamp. As the clamp closes the dies, a limit switch energizes the booster-injector valve solenoid, and a timer. Pressure oil from the clamp line now flows through the formerly closed pilot valve, and shifts the booster-injector valve. Now, No. 2 pump and the big accumulator begin to inject metal at high speed, but simultaneously, the already-primed differential booster piston comes under pressure and, closing the booster check to prevent back flow, the clamp pressure is doubled. When the preset time interval (for metal freezing) elapses, the booster-injector solenoid drops, allowing pressure oil to retract the injector and venting the booster to the sump. Another timer then closes a circuit, which together with a limit switch on the injector linkage, acts to trip the solenoid latch on the clamp valve, originally engaged by momentary movement of the hand lever. The clamp opens, accelerates and slows down as before. The carriage linkage trips the ejector valve, the casting comes out of the cavity and the cycle is over.

on projected die cavity area and injection pressure), pump pressure and capacity, and piston area, and speed and smoothness of die opening and closure. Getting these all into balance usually results in a rather complex hydraulic system, but when well worked out, troubles should be rare.

Automatic Controls

Casting uniformity as well as speed demand a system of interlocked cycle-event controls. All the various pressures and temperatures must be automatically regulated, and of equal importance, the die must remain closed for a predetermined and absolutely constant length of time. This much is taken for granted in any die-casting machine. Fully automatic machines which do not require an operator seem a remote possibility because despite a very high degree of uniformity, minute variables beyond the range of practical control can cause casting differences such as flash or other fragments of metal that will remain in the die. Therefore, each part should receive a quick inspection and the die be blown out and/or lubricated before starting the next cycle.

Cold-chamber machines have been improved in some instances with automatic ladling devices where the duration of the run justifies the specialized setup usually required. Alloy pots do not hold a lot of metal. For consistent casting, new metal plus returned, clean and pure scrap should be introduced in small amounts at frequent intervals.

Melting equipment, including the furnace and pot, is not considered an integral part of the cold-chamber machine, but with the gooseneck machine it is. Naturally, cold-chamber machines require a convenient source of ready metal, and where several machines are in steady production, one pot is sometimes arranged to serve them all. All plants of any size have a monorail conveyor system to transfer both cold and hot metal from the alloying and receiving departments to the machines.

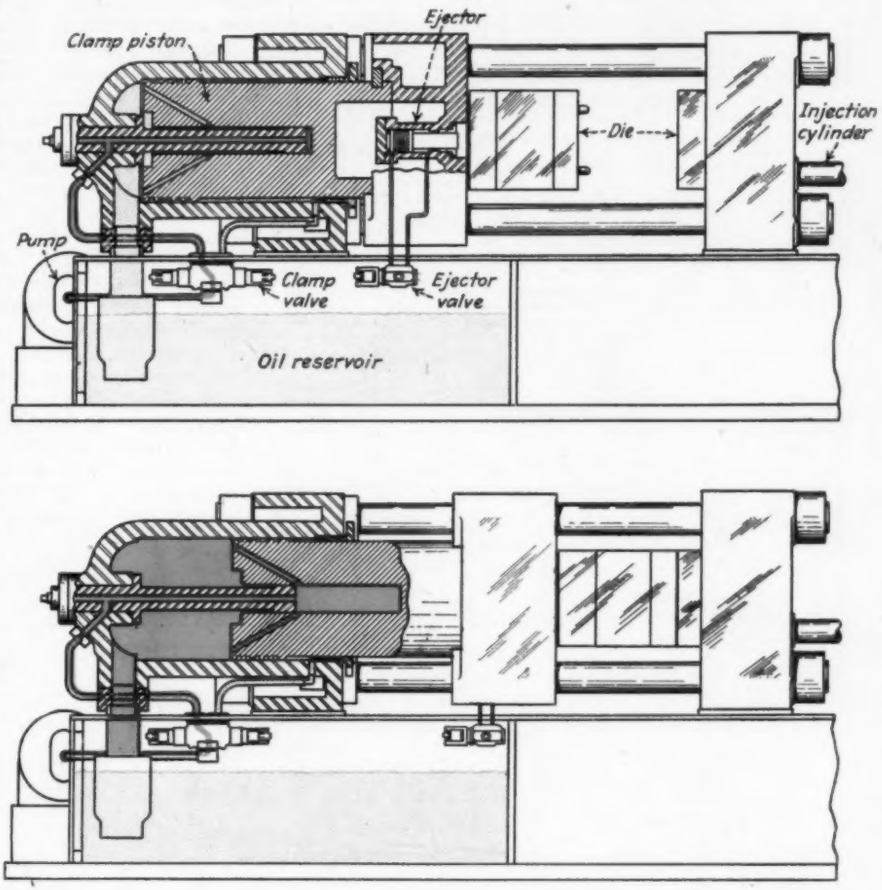
Electrical control of the type customarily found in modern machine tools is standard on die-casting machines, too. But with hydraulic or air operation almost universal except on very small machines, the electric motor plays a comparatively minor role, and the controls are chiefly electro-hydraulic or electro-pneumatic in nature. Operators have the option of tying the cycle events together with the several timing interlocks, or of operating any component as an independent unit. Also important are the thermostats which keep continuous watch over furnace, and die temperature.

Automatic machines have been built, too, which are almost completely mechanical, where variables are adjusted with linkages and cams. There is no such thing as the ideal or universal machine. Experienced judgment is necessary to select the right machine for a given job.

Furnaces

Gas or oil is the common fuel. Zinc is cast at such a low temperature (about 750 F) that oil may burn too hot and natural or bottled gas is the preferable fuel. One plant finds its economical to buy propane by the tank car, evaporate and carburate it outside and pipe it.

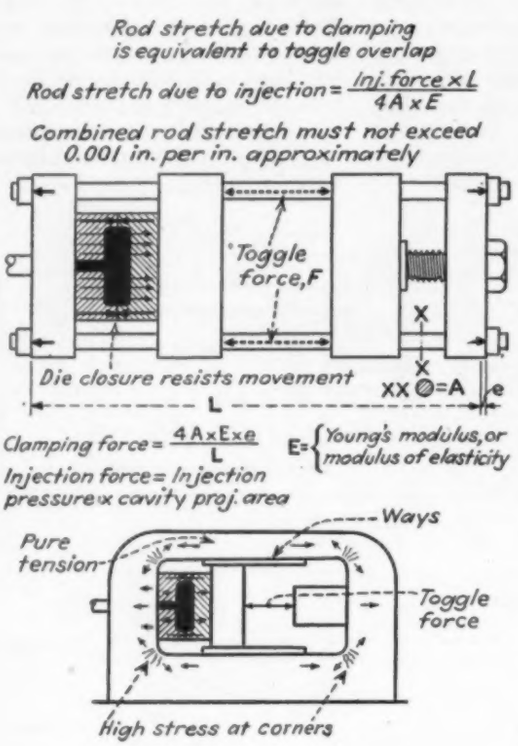
Some casters are adopting electric induction furnaces, but the costs may offset the advantages, especially on a large-scale operation.



DIFFERENTIAL-PISTON TOGGLELESS ALL-HYDRAULIC MACHINE CYCLE

An adjustable-volume (radial-piston) pump moves the clamp toward closure at high speed as soon as the solenoid valve is actuated by the starting push-button. While the small center chamber is rapidly filling, the large chamber at the head end of the piston is sucking oil from the reservoir through the big pipe and a suitable check valve. At a preset position, near the point of closure, drilled passages in the piston connect the small central pressure chamber to the large, already filled but low-pressure chamber at the head end. The check valve closes, the piston slows down and pressure builds up to exert a high total force because of the large piston area. All this is accomplished with relatively small volume of pressure oil flow and with a minimum of piping and valves. The point of slow down and pressure build up is adjusted by turning the central stationary plunger with a wrench, and thereby rotating a helical groove on its exterior for either earlier or later connection with the drilled passages. This, plus the pump stroke control and the relief valve setting adjust the clamp stroke, speed and maximum pressure, respectively. Clamp return speed is high because of the small volume in the annular space between the piston and the cylinder. Injection is electrically timed and pneumatically (nitrogen) powered. A small gear pump acts on the return side of the injecting cylinder piston while a nitrogen bottle is permanently attached to the injection side. Injecting speed is regulated by throttling the oil.

FORCES IN A DIE-CASTING MACHINE


Rod stretch due to clamping is equivalent to toggle overlap
Rod stretch due to injection = Inj. force x L / 4A x E
Combined rod stretch must not exceed 0.001 in. per in. approximately
Toggle force, F
X
X
Die closure resists movement
XX ⌀=A
e
L
Clamping force = 4A x E x e / L
E = Young's modulus, or modulus of elasticity
Injection force = Injection pressure x cavity proj. area
Ways
Pure tension
Toggle force
High stress at corners

TENSION RODS in a toggle-actuated press are highly elastic springs. When the toggles lock, the compressional force on the links and pins would be infinite if the tension rods did not stretch. But they do stretch and the die is clamped not rigidly, but with a very heavy spring pressure. Added to the clamping force, the injection pressure then comes along. This opposes the clamping force on the die, of course, but the two combine to stretch the rods even more. The die has only to withstand the clamping force, then the diminished differential between clamping and injection force, but the toggles must withstand the two forces added together.

Tension rods also must absorb both forces without a permanent set (exceeding their elastic limit). The die will only open if: (1) the total injecting force exceeds the clamping force, which is impossible because the latter will increase as compression on the clamping members is increased; (2) the die parting itself distorts (not a function of the press). Total rod cross-section need only be capable of stretch within its elastic limit, or to put it another way, the stress should not exceed about 30,000 psi.

No two dies will be the same thickness, and even with shims, toggle overlap will vary. Usually, die changes mean a major adjustment of the gap opening and therefore a sizable change at the toggles. To prevent overstressing the machine, and to prevent slamming the die halves together, the final adjustment must be very carefully made. This is particularly true of the box-frame machine, in which stress results not in pure linear stretch but in highly complex bending strains. The machine is purposely built so strong that these strains (distortions) are negligible, and toggle overlap must be only enough to overcome backlash, or something will be damaged

DIE CONSTRUCTION AND OPERATION

Anywhere from about 1,000 up to a nearly infinite number of castings may be produced successfully from a single die-casting die. The lower limit of practicality is based on the "breakeven" point where the operation begins to show a profit. The upper limit of possibility depends on the ability of the die to withstand fatigue and wear-and-tear according to the alloy being cast.

The die is a multi-piece permanent mold which shapes the desired part on all surfaces, exterior and interior when in its closed position, and holds this shape within close limits against the distorting influences of high pressures and temperatures. When it opens (automatically) not only is the finished casting completely exposed for removal, but it is ejected immediately from the cavity.

Single-cavity dies are the logical first step. When a lot of fairly small and simple parts are needed, it is often economical to build a *multi-cavity* die containing almost any number of identical molds depending on the machine size and injecting capacity available. When several different castings are required in fixed quantity relationship as in a carburetor, for instance, a *combination* die will be the likely solution, When different parts are required in varying quantities and a large machine is available, *unit* dies can be built to assemble on the press platens enabling one shot of metal to fill a variable number of cavities.

The die always separates primarily along a plane parallel to the press platens. This is called the parting plane and the perimeter of the casting intersected by this plane is called the parting line. As the parting line must always come at the widest point, it must be joggled or made angular sometimes. Box-like parts and those with blind recesses are formed by dies which have a depression in one half and a matching raised portion in the other. Often, this raised portion is a cylindrical pin in which case it is called a fixed core. Fixed cores may pass completely through the cavity and into a pilot hole in the opposite die half thus making a hole through the casting.

Very often, to obtain the advantages of complex design possible with die casting, moving die parts are re-

quired. Holes that are not parallel to the opening and closing line of action, undercuts, and surfaces which cannot be parted easily necessitate the use of moving cores, slides and loose pieces or expanding cores. These are all integrated and interlocked with the die opening and closing action where possible to insure fool-proof assembly and to save time.

Components

The major die components are known as the cover half and the ejector half. The cover is usually bolted to the stationary platen into which fits the injection nozzle so the cover half carries the sprue hole. The ejector half travels with the sliding platen or carriage, and contains the ejector pins, the ejector-actuating mechanism and probably much of the other mechanism for moving cores and slides where used.

Metal enters the cover portion of the die, passing from the nozzle to the sprue hole. From here it is distributed through carefully designed runners to the part cavity. This juncture is called the gate. This step, apart from the shape of the part itself (which isn't capable of much variation in design usually), is the most important single factor in making a successful die which will produce clean, smooth, sound castings. And it is usually the runner and gate which has to be changed or altered before perfect castings are possible.

Gating

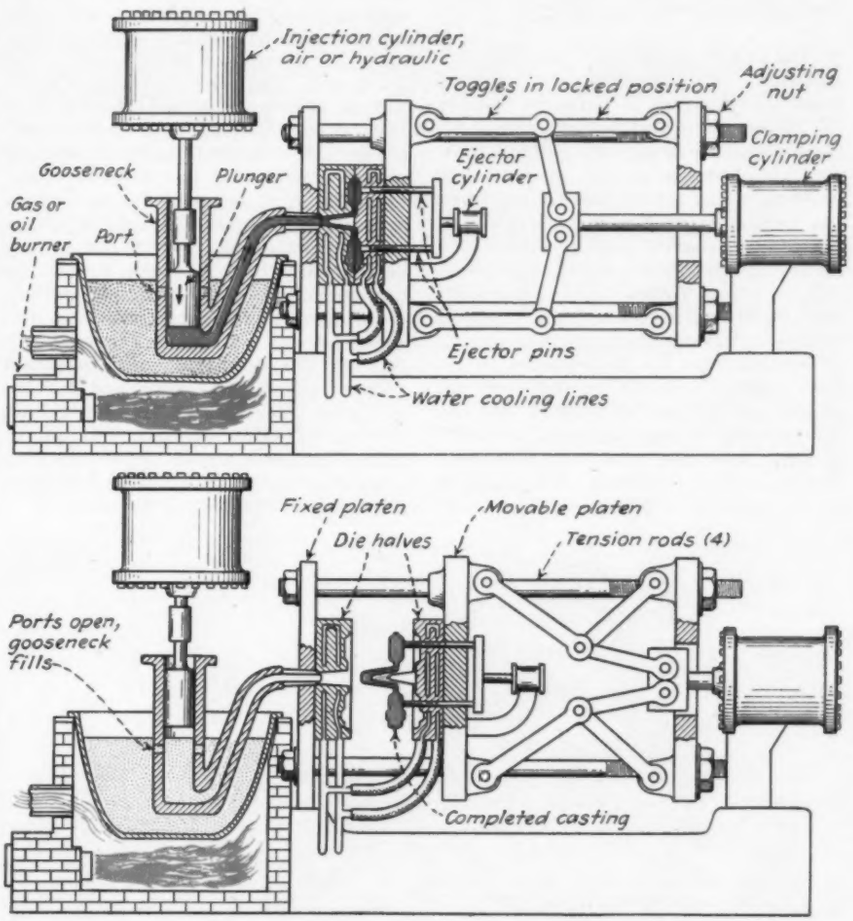
For simplicity and ease of alteration (as well as original construction) the gate is always in the parting plane. The sprue which feeds metal to the gate can be drilled straight through the cover half parallel to the line of clamping, or it can be centered in the parting plane, half in each side of the die. In either case, the sprue must be designed to break off easily when the die is opened, allowing the frozen casting, gate and sprue to eject, and allowing the remaining metal to return to the pot (in submerged injection machines. Cold-chamber machines cast all the metal that's ladled in; there is no residue.)

Moving die components tax the skill of the designer and the craftsmanship of the toolmaker. They must be simple, accurate and reliable under the highly-destructive influences of severe mechanical shocks, high pressure, high temperature, and erosive and corrosive liquid metal.

Automatic actuation principles are closely interrelated with the function and specific physical location of each component under consideration. Every die requires ejectors. In simpler dies, the ejector plate is operated either by a hand lever through a linkage, or directly by the machine itself, as the moving platen retracts into contact with some fixed member.

Other dies employ air or hydraulic cylinders. Angular slides and cores are more complicated. Direct action derived from machine movement is obtainable by linkages, typical examples of which are the inclined pin, and the rack and pinion. When the generally preferable direct action is difficult or inconvenient, hydraulic cylinders are resorted to, and many machines have built-in provision for connecting and synchronizing additional hydraulic elements.

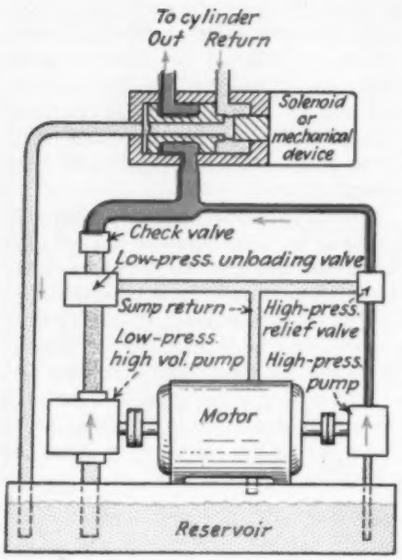
Ejector pins are placed wherever possible to bear against the surplus metal which will be trimmed later in order to prevent marring the surface of the piece itself. In some cases, ejectors can be in the form of sleeves surrounding fixed cores so the ensuing spot will be around a hole in the finished part. Ejectors should be arranged to lift the casting from the cavity without strain.



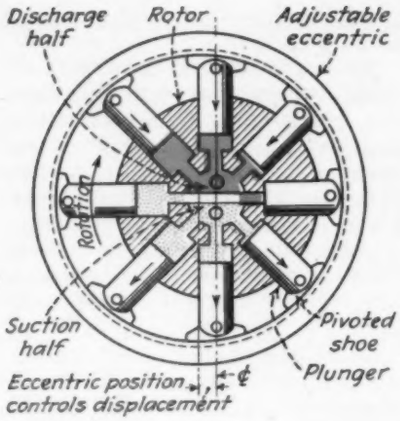
SUBMERGED-PLUNGER, TOGGLE-CLAMPING AIR MACHINE—CYCLE

Setup must be adjusted before operation so toggle links will make a straight line, imparting some but not too much pressure on the dies, when the clamping cylinder is at full stroke position. Double toggles allow fast traverse, good acceleration and deceleration, and minimize banging, all with low fluid pressure and/or displacement, because of the infinite mechanical advantage.

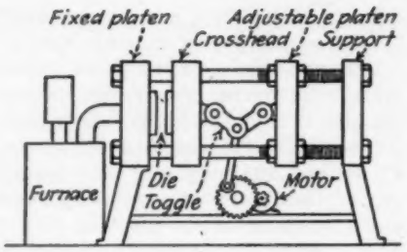
Injection occurs in semi-automatics (upper diagram) as soon as the safety limit switch closes, insuring that toggles are fully locked. Pressure is maintained until metal solidifies, then injector retracts, toggles open and ejector pushes casting from the die. Water lines in die halves maintain die temperature.



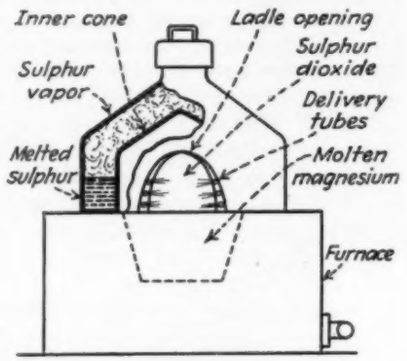
HYDRAULIC CIRCUIT suitable for actuation of reciprocating machine elements requires a pressure source (in this case a high-volume low-pressure pump, followed by a high-pressure, low-volume pump), a reversing valve to direct the oil flow to and from the two ends of the hydraulic cylinder, and a control device, which can be mechanically or electrically, pneumatically or hydraulically operated. The check valve connecting the two pumps automatically causes the pumps to become effective in sequence, to fill the cylinder rapidly as long as its piston rod encounters little opposition, but to build up high pressure for overcoming resistance whenever it is met. Relief valves protect the system when maximum pressure is reached



ADJUSTABLE-VOLUME PUMPS rotate at constant speed but flow is controllable. Clamp and injector-piston speeds and machine cycles can be set with a minimum of fittings and complicated piping, giving greater flexibility for adaptation to different alloys, die heights and shot amounts. Radial-piston (above) and axial-piston (not shown) pumps are both positive-displacement, variable-stroke, plunger pumps. Oil flow to and from the rotor cylinders is directed by the stationary valve in the center. Plunger stroke is effected with a stationary but adjustable eccentric ring which guides the plunger shoes, causing the plungers to reciprocate in the rotor with a stroke equal to the amount of eccentricity. Moving the eccentric back to center reduces oil flow to zero and further movement past center reverses the direction of flow. In the axial-piston pump, plungers are mounted in a barrel-shaped rotor and flow is regulated with an adjustable wobble plate



CRANK CLAMPING electric motor powered, is a variation of the toggle used on some smaller machines. It can be run continuously or not, depending on the work, and many small parts are being produced on a fully-automatic basis



SULPHUR, melted and vaporized by the furnace heat, completely encloses the melting pot top in a double-walled cone. When the ladle is introduced sulphur vapor escapes through slots around the ladle door, and on contact with air, immediately burns. This keeps the molten metal covered with sulphur dioxide, preventing oxidation of the metal

HOW TO DESIGN DIES

The sprue, runner and gate arrangement should be as short as possible and have as few bends as possible to minimize the scrap (heat is wasted although the metal isn't) and to reduce turbulence and consequent air entrapment, soldering, and other defects.

Specific gate and vent (or overflow) arrangement is almost impossible to analyze. Good design is a matter of experience, intuition, and experimentation. Theories involve too many variables. In general, metal should flow in at one end of the cavity, filling it as smoothly as possible with a minimum of direct impingement on any particular spot, and be allowed to overflow at the last region to fill. All this should take place before any part of the casting begins to freeze and "ramming" or maximum pressure should be effective as soon as the metal stops flowing, *and* before it freezes anywhere. Multiple gates are sometimes necessary, but they complicate the problem by causing inevitable "collisions" between different metal flow paths in the cavity.

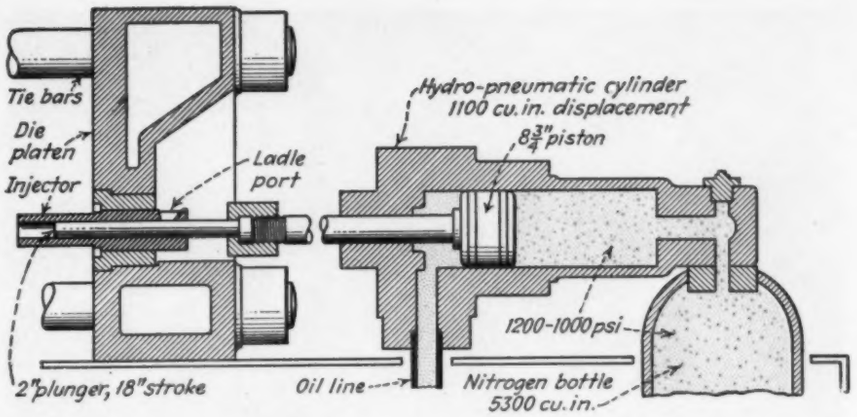
Evacuating a die is impractical so air must be expelled with every shot. Dies are normally vented by allowing fairly generous flash as it is impossible to prevent flash entirely, and thus dispense with trimming. A sizable flash makes no more work than light flash, in fact, it makes trimming easier, in addition to venting the die. Small overflow wells are sometimes provided, too, when the cavity has a large volume in proportion to its parting perimeter.

But these precautions won't prevent air entrapment. Less injection speed would reduce turbulence but would also defeat the advantage of die casting: high speed. High pressure, on the other hand, tends to compress any entrapped air (usually finely divided anyway) into such tiny bubbles that even X-ray has trouble locating them. This kind of gas porosity (as distinct from relatively large gas voids) has been shown in many cases to have improved casting strength and quality, rather than harm it. Even though the trapped air is under terrific pressure, the volumes are so minute that any stress so created is negligible.

Most surface imperfections, like cold laps, cold shuts, soldering, chills, and swirls, are caused by poor metal flow. Laps and swirls are caused by collisions between two different streams when the metal temperature is too low to allow mixing. Soldering is caused by direct impingement, and results in metal sticking to the die. Chills are the result of too-cool die surfaces, and/or insufficient or delayed injection pressure, and show up as tiny laps, pockets and cracks in the casting surface. Splashes give much the same effect as chills, but are more likely to occur in heavy sections which are not filled evenly. Higher die temperature obviates many of these troubles, but like slower injection speed, it slows down the cycle execssively.

Shrinkage voids or shrink porosity occurs when a large section of a casting cools at an uneven rate or cools slower than adjacent sections. It is the result of too small a gate to allow continuing pressure during cooling, or of a casting containing thin and thick sections. One way to minimize shrink voids is to eliminate the thick section by coring or use of ribs instead of solid construction. Adequate gating to the thick section should help, too, because it will be the last region to solidify.

Permanent-mold, and other slow methods of casting are known to give sounder, more homogeneous castings than possible in this method.



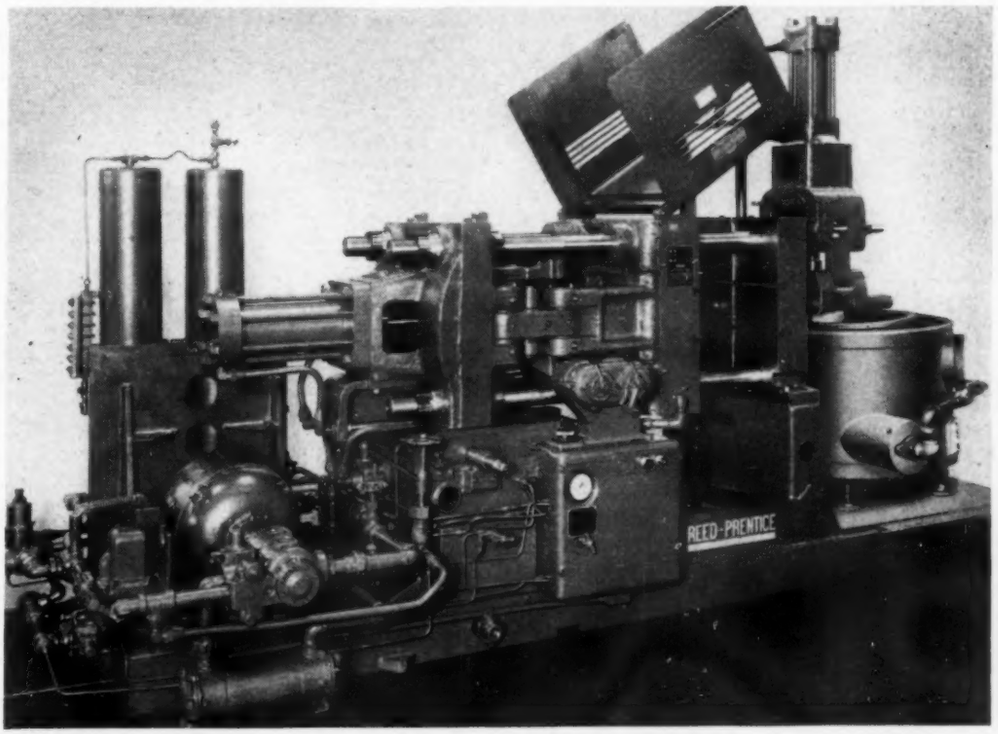
HIGH-SPEED INJECTION with no explosion hazard is accomplished using a nitrogen flask to drive the piston and oil to retract it only. Flask volume is large compared to cylinder displacement so expansion and pressure drop are low

Now, this drawback is disappearing, due largely to more science and less guesswork. Die casting is fundamentally a problem in hydraulics where viscosity, pressure and speed of the medium, together with the shape and surface condition of the flow passages are most important. Many of the post-mortems can be eliminated if these factors are given due consideration at the outset. Top-notch casters aren't over eager to give out detailed procedure information on this newest key to casting success.

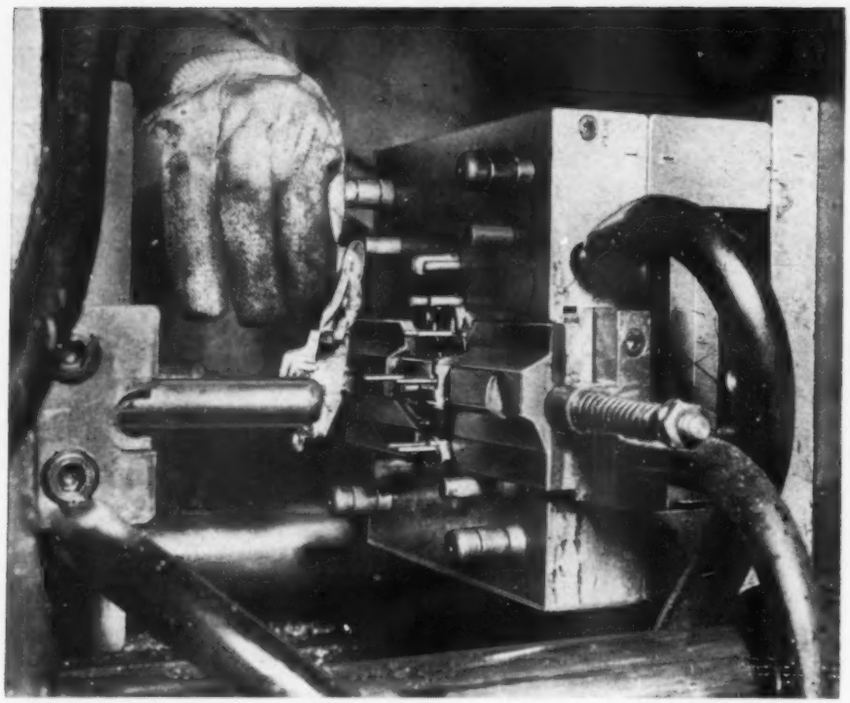
BASIC PRODUCT ANALYSIS

Determine relative importance of the following factors before attempting design of dies:

SHAPE: Can shape, size or contour be altered?
SURFACE: What kind and how much surface detail; finish required?
STRENGTH: Will part be structural or decorative?
ACCURACY: Functional machine component or particular assembly problem?
WEIGHT: Is lightness desirable or important?
QUANTITY: Break-even, re-orders, possible changes?



THIS HOT-CHAMBER machine has 150-ton clamping and 8300-lb. injecting forces with a 15-hp., 1000-psi., nitrogen-accumulator hydraulic system. With largest plunger, 10 lb. of zinc can be shot into a cavity of 300 sq. in. projected parting line area at 1000 psi., but plungers can be changed, shooting less metal at higher pressure; pump pressure is adjustable as well. Platens are 28 x 29 with 15 x 18 bar clearance, and dies can vary from 6 to 18 in. in thickness with 10-in. platen stroke



LOCOMOTIVE TRUCK DIE requires two slides to form outside details of journal box and springs. Cover half, left, carries cam pins which fit into and pull slides inward against their springs as ejector half, right, comes forward. Eleven ejector pins here are operated by machine frame as the moving half retracts. The machine used for this job is of the electric motor, crank clamping type shown two pages earlier

Preliminary Steps

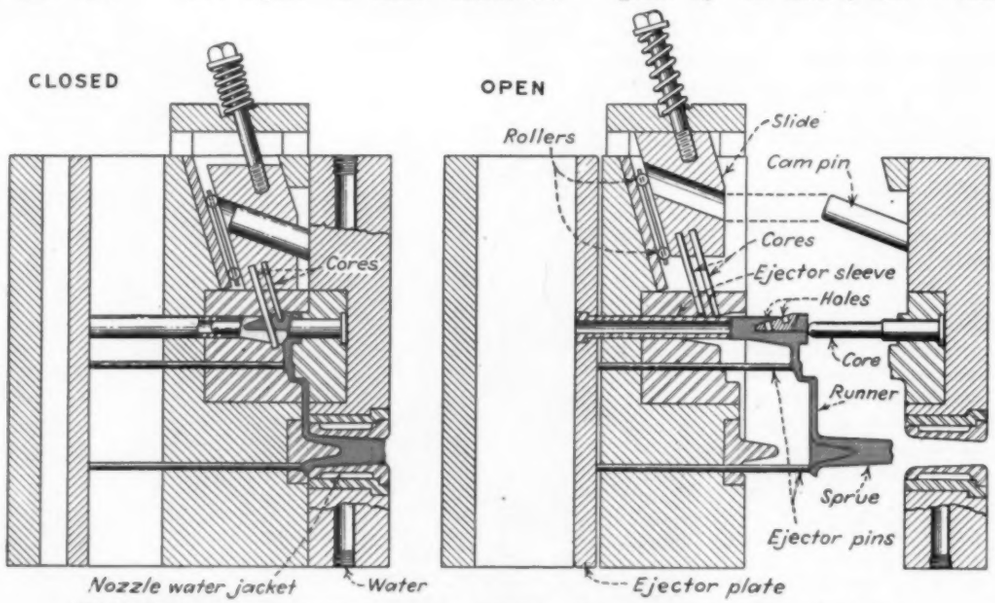
Close cooperation between all interested parties during the initial design stages and time spent in weighing all possibilities wil be adequately justified later.

1. Make tentative alternate product layouts covering different alloys, casting arrangements and estimated finishing steps with due consideration to existing or projected plant facilities. Compare other methods of manufacture and combination manufacture.
2. Decide whether one casting, two castings or several castings (to be permanently assembled) will make the best job and how costs will figure on these alternates. (Large units, like automobile radiator grilles, now tend towards an assembly of castings rather than a single piece.)
3. On the basis of estimated die costs, metal and casting cost, calculate the minimum volume required to "break even" on competitive part cost.
4. When the above are fairly well established (but still not yet frozen) it is time to begin layout.

Designing the Die

1. Type of die (considering machine and alloy to be used) depends on part size and quantity, and the number of castings comprising an assembly, (the ratio of individual elements).
2. Part assembly: Bearing bushings, studs, screw threads, rivets—(inserts?)—holes, undercuts, bosses, shoulders, flanges and all surfaces which will be in fixed, moving or intermittent contact with other components in the assembled product must be taken up next.
3. Stress-weight factors like dynamic balance, pressure tightness, type of mechanical load or shock govern section shape and thickness to a large degree.
4. Abrupt contours and changes in section thickness should next be modified, reduced or blended wherever and as much as possible. This is a fundamental of good casting.
5. Surface smoothness and/or casting soundness (control of porosity) are affected in varying degrees by the above, but in the

MOUNTING PADS on this motor-bracket casting have been redesigned at an angle. On earlier models, the locomotive drive required two more gears, a shaft and bearings, now eliminated by tilting the motor slightly



INCLINED SLIDE, carrying cores to produce the locating and fastening holes, presented an unusual design problem. Rollers were used to reduce friction, but this represents about the maximum in plain cam-pin slides

last analysis, gating and venting have the final say. They can remedy or offset other necessary evils or they can ruin even the simplest casting die.

6. As all factors are interrelated, a change in one affects the rest, and the final design is a carefully balanced compromise.

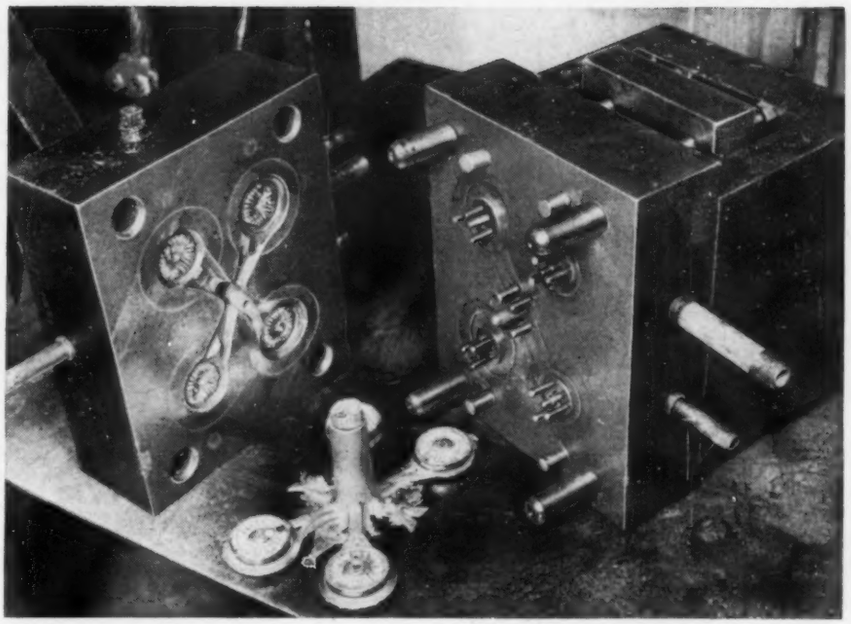
Final "Adjustments"

Casting technique, unlike the finished die, admits of many operating variations. Die temperature can be regulated with the water lines. Metal temperature is controllable in the furnace and in the injection nozzle. Injection speed and pressure can be adjusted over wide ranges. Dwell or chilling time can and should be regulated closely. Die life (and uniformity of castings) is governed by the above, plus other factors which may or may not affect the individual casting. Slamming the die shut or excessive or unequal clamping pressure should be guarded against continually.

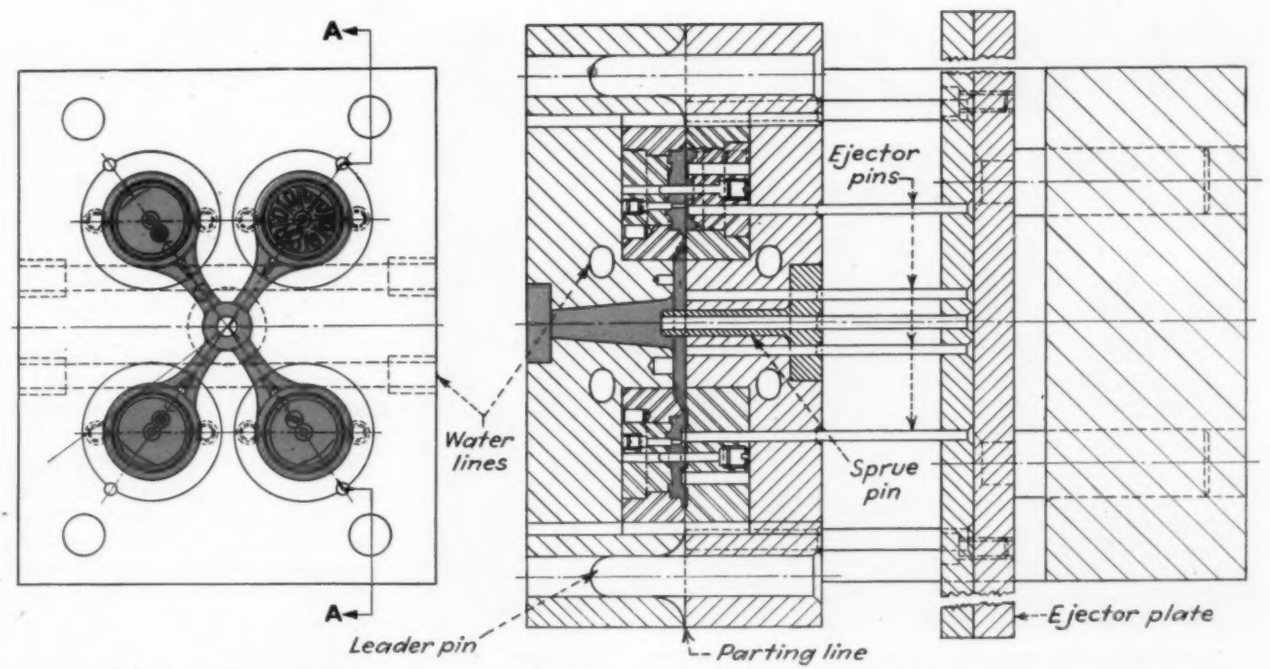
Trial shots are the only test of a die. Satisfactory castings may come immediately or after small procedure variations, but often the die requires alteration. Gating and venting changes are common and not too difficult. If these fail, the cavity itself may be changed.

Initial "satisfactory" castings should be thoroughly tested in exaggerated service, and should be sawed sectionally before and after service to determine the soundness and failures in use. Radiography and specific-gravity tests are extensively used where porosity restrictions are extremely strict.

Every casting will have small variations and individual inspection after casting may or may not be required, depending on the cost of subsequent operations. Two dies made from the same prints by the same men usually show distinct differences in the casting produced, and the need for final adjustments can never be eliminated.



NUMBER OF CAVITIES usually depends on production ratio. This "gate" of wheels was not produced in this die, but in a very similar six-cavity die. (Two of the wheels have been broken off.) Cover half, left, carries the entire impression so the ejector pins will bear on the flanged rear surface of the parts



MULTIPLE-CAVITY DIES are often built with hobbed, inserted duplicate cavities. This four-cavity locomotive-wheel die has water lines in both halves for high production, and the cavities are gated generously, assuring good filling and proper solidification. Ejector pins, designed for automatic mechanical actuation, bear on sprue and back side of wheels where marks won't be objectionable. Note ejector in center of sprue

DIE STEELS

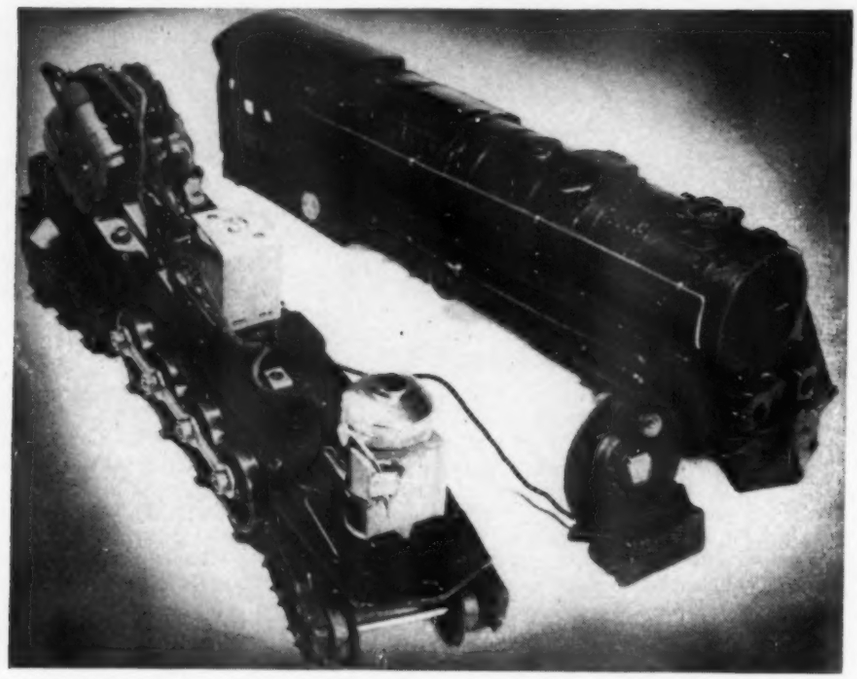
Selection of the best die steel for a particular job or for general use by the die shop is predicated on an extremely large number of factors and standard reference works on the subject contain a long list of recommendations. High-grade machinery steels, non-hardened are satisfactory for some jobs, but alloy steels are distinctly preferable for long runs, and are mandatory for high-temperature casting.

Chrome-vanadium steels of many compositions have been and still are in wide use after more than 15 years. One has 2.25%Cr, 0.2%V, 0.6%Mn with 0.45% carbon, and is hardened at 1600 F, oil-quenched and tempered around 800 F. to about 430 Brinell. This is good for long runs with zinc and short runs with aluminum.

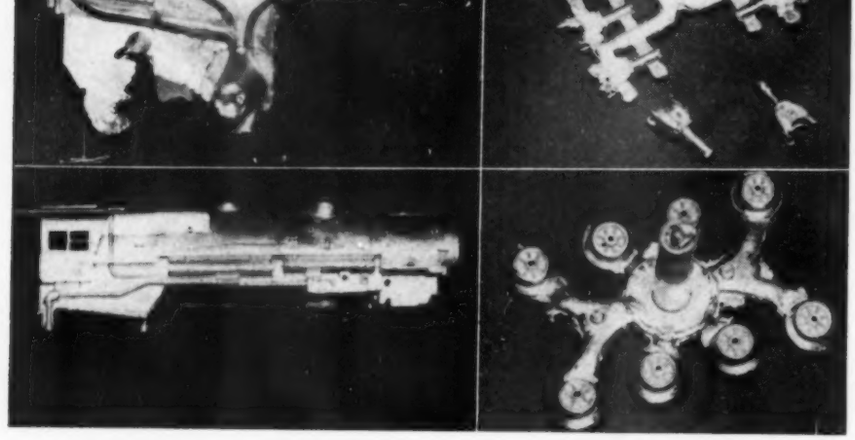
Molybdenum and silicon, as well as double the chromium (1%Mo, 0.9%Si, 5%Cr, 0.2%V, 0.6%Mn and 0.3%C) gives a modern steel for aluminum and magnesium casting. It is brought to 1800 F. in 1½ hr./in. of thickness, held for the same time, air-quenched and tempered at 1000 F. to about 450 Brinell.

1% tungsten and 0.5% cobalt are often added to the above composition; this steel is hardened in identical fashion and used for the same purpose.

10% tungsten, with 3% chromium and 0.5% vanadium and 0.35% carbon, hardened at about 2000 F., immediately air-cooled and tempered at 1000-1250 F., makes a steel which is fairly suitable for brass die casting. Many other compositions are under test, but a satisfactory solution has not yet been found.



Good Metal And Excellent Surface Finish are essential to even such low-cost competitive items as toys. Around 35 individual castings, let alone all the other components, are used in a single locomotive and tender which must sell for about $25. Typical parts, and a die, are shown on this and the next page



A Toy Locomotive involves castings of many types and sizes, from several pounds down to a fraction of an ounce. Sprue, runners and flash are clearly visible on the boiler top, with the trimmed casting below. At the right are two 8-cavity "gates" of wheels, and knuckle couplers. Blanking dies trim all surplus metal in a simple press operation

Heat Treatment

Dies should be packed to prevent scaling, and the packing material must be carefully selected to minimize carburizing or decarburizing. When 1800 F. or over is required, aluminum oxide grain, 8-12 mesh, or properly prepared 6-8 mesh pitch coke are satisfactory.

About 50 more steels, containing some or all of these constituents, are in use at present. This figure attests to the divergence of opinion on the optimum composition, and suggests that long experience is the best guide to selection.

Obvious factors are metal cost, especially of the scarce elements, machining difficulty and cost (compared to expected life) and details of the job for which required. Die life is primarily limited by resistance to thermal distortion and fatigue cracking, and by its resistance to solution or erosion by the molten shot. Very important is the dimensional stability over wide temperature ranges, and hardenability without loss of accuracy.

Zinc, cast at less than 800 F, doesn't tax dies thermally, but hardened steel is preferred to resist mechanical wear and banging, especially when the die has a lot of moving elements. Small shops often buy die steel already hardened to about 200-300 Brinell to eliminate necessity for further treatment, except for a low-temperature stress-relieving draw after machining. Dimensional changes are corrected by grinding.

Warping and distortion, and checking are minimized by keeping heat transfer during hardening, quenching and drawing, and during use, as slow and uniform as possible. Oil-quenching steels are less desirable for dies because of the large mass involved and the difficulty of cooling uniformly. Dies should be preheated or "warmed up" before use by means of the water lines to about 350 F, and the working temperature held should be a compromise between loss of hardness or erosion, and thermal shock. Of course, casting speed (metal solidification) and surface quality are equally important.

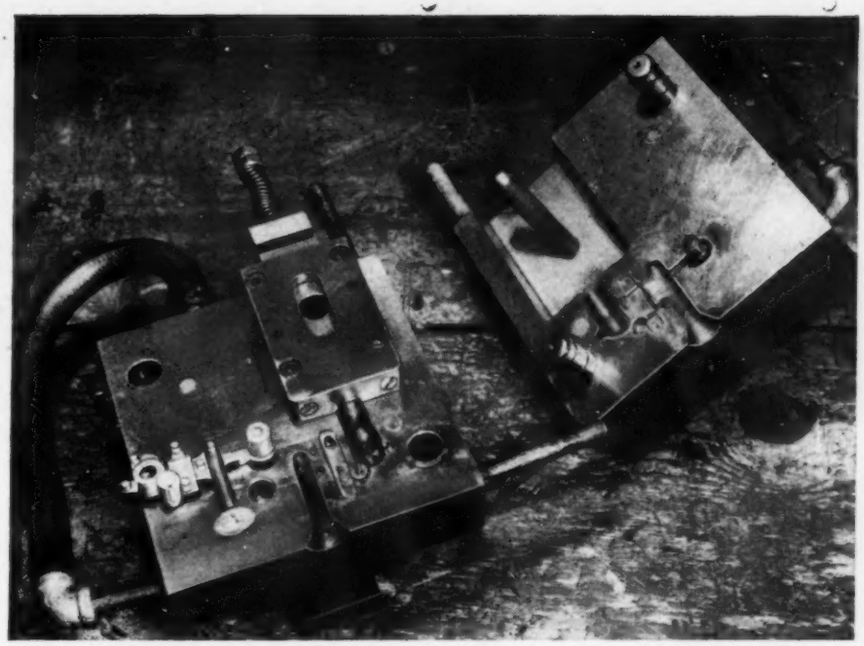
Moving Parts

Core pins, slides and other moving parts can be of the same steel as the die itself, or high-speed drill rod, or ordinary machinery steel, casehardened, may be used.

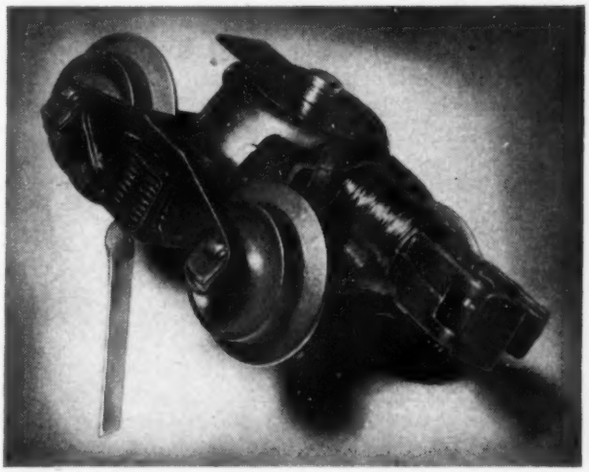
Moving parts must resist wear as well as hot metal, but contours are usually simple.

Many dies, especially those containing multiple cavities, are built up of several different metals. Die blocks can be of ordinary steel, non-treated, while cavities, runners and all areas in direct contact with molten metal are inserts of the selected alloy steel.

Most dies are machined with standard universal millers or die sinkers. When a lot of identical cavities are required, it is sometimes practical to make a very hard master replica of the desired casting and sink it into soft steel with a hobbing press. Precision-cast (lost-wax process) stainless-steel dies are under experimentation, and there is some possibility of precision-casting even higher-temperature alloy dies, using metals similar to those being used for gas turbine blades.



Combination die which produces two parts for a toy lamp post. Note spring slide and cam pin, which core one casting, water lines, register pins, and ejector pins which bear against overflows and do not mar the detailed casting surface



This Freight Car Truck (two to a car) has four castings: two sides and the 2-piece coupler. Other components are stamped or machined

HOW TO SELECT ALLOYS

Magnesium is not die cast to a large extent at present, but on a volume basis it is cheaper than either aluminum or zinc, and this favorable differential is likely to grow as its use increases and the other metals become more expensive. Engineers and laymen alike have a healthy fear of magnesium, but danger exists only when there is carelessness in its handling. All its casting and machining properties compare favorably with its competitive alloys, and a magnesium casting can exceed a zinc or aluminum casting in strength and still cost less than either. Generalizations of this nature are dangerous, and no one expects magnesium to replace any other material entirely for plenty of reasons.

Aluminum is gaining rapidly on zinc because zinc costs over twice as much per cubic inch and all other factors are nearly enough balanced for so many applications. It is easier and cheaper to polish aluminum than it is to electroplate zinc, in fact, the as-cast surface may require no further treatment.

Zinc, however, is by no means falling off. Production of die castings of all types has almost doubled since the end of the war and is nearly four times the 1937 figure. 280,000 tons of die castings were shipped in 1946 and 400,000 tons is the expected 1947

production. Die castings are replacing iron castings and other expensively produced units in everything from zippers to aircraft-engine cylinder blocks.

Three-fourths of manufacturers queried in a recent extensive survey made by *Die Casting* magazine reported that die castings are replacing or have replaced other components in their latest designs, and over half of the remainder said that new die-cast designs were on the drawing boards.

The 1947 Thomas Register of American Manufacturers lists 148 jobbing die-casting firms (responsible for about 75% of total production) and 23 manufacturers of die-casting machines.

ZINC

Zinc alloys for dies-casting now boil down to three as a result of 25 yr. of experimenting. The American Society for Testing Materials Specification B86-43 gives the safe commercial composition limits for the three alloys which they name XXI, XXIII, and XXV. The Society of Automotive Engineers specifications include these same alloys under the Designations 921, 903 and 925 respectively. The New Jersey Zinc Company deserves much credit for these developments, and the engineering societies assume no liability for patent infringements arising through use of their specifications. NJ Zinc sells the same three alloys in ingot form, made to closer limits, under the names Zamak 2, Zamak 3 and Zamak 5, and also the license to make them.

Alloy XXI is hardest and strongest initially, but it is dimensionally unstable and loses strength in time, and is seldom used now. Alloy XXIII is the most stable while Alloy XXV has the best corrosion resistance under adverse conditions, but there is little choice between XXIII and XXV under ordinary conditions.

Aluminum is introduced in zinc alloys to improve their physical properties and ease of casting. 4.3% aluminum gives optimum results but impact strength is seriously affected when the amount exceeds 4.5%, and at 5% the metal becomes extremely brittle. With less than 3.5% aluminum, the metal begins to lose stability at such a rate that it is halved when the aluminum content is 2%. The specification limits provide for reasonable latitude in preparation without adverse effects.

Magnesium inhibits subsurface network corrosion. 0.03% is necessary for this reason and any in excess of 0.08% makes the alloys hot short and reduces their impact strength. 0.04% is optimum. Fluxing, to recover the maximum of alloy from remelting, removes magnesium. As little as 3 lb. per ton will appreciably reduce it, and slightly more flux will remove magnesium entirely, which then requires replenishment.

Copper content affects aging characteristics and corrosion resistance and zero copper (Alloy XXIII) has best stability. 1% copper (Alloy XXV) represents a compromise between stability and corrosion resistance, preferable when castings are to be used at elevated temperatures in corrosive atmospheres. (Close copper control implies closer tolerance to other associated contaminants.)

Tin and *Lead* promote subsurface network corrosion (zinc's greatest enemy in its early years) and the percentages stipulated are lower than the safe maximum to allow for reasonable analysis error.

FREQUENTLY USED DIE CASTING ALLOYS

		ZINC		ALUMINUM			MAGNESIUM	BRASS			
DESIGNATION	A.S.T.M.	XXIII	XXV	SC 6	SG 3	G 2	AZ 91	Class A	Class B	—	—
	N.J. Zinc Co.	Zamak 3	Zamak 5	—	—	—	—	—	—	—	—
	ALCOA	—	—	A380	360	218	AM 263	—	—	—	—
	Dow Chem. Co.	—	—	—	—	—	R	—	—	—	—
	Doehler-Jarvis	—	—	—	—	—	—	—	—	Doler 5	—
	Tital Metal Co.	—	—	—	—	—	—	—	—	—	Tinicosil 20
COMPOSITION	Aluminum	3.5-4.5	3.5-4.5	Remainder	Remainder	Remainder	8.3 to 9.7	0.25 max.	0.15 max.	1.0	—
	Magnesium	0.03-0.08	0.03-0.08	0.1 max.	0.4 to 0.6	7.5 to 8.5	Remainder	—	—	—	—
	Copper	0.10 max.	0.75-1.25	3.0 to 4.0	0.6 max.	0.2 max.	0.5 max.	57.0 min.	63 to 67	83.0	46.0
	Zinc	Remainder	Remainder	0.6	0.5	0.1	0.4 to 1.0	30.0 min.	Remainder	Remainder	Remainder
	Tin	0.005	0.005	0.3 max.	0.1 max.	0.1 max.	—	1.50 max.	0.25 max.	0.25 max.	—
	Lead	0.007	0.007	—	—	—	—	1.50 max.	0.25 max.	0.25 max.	1.5
	Silicon	—	—	7.5 to 9.5	9.0 to 10.0	0.3 max.	0.5 max.	0.25 max.	0.75-1.25	5.0	—
	Nickel	—	—	0.5	0.5	0.1	0.3 max.	—	0.25 max.	0.25 max.	16.0
	Manganese	—	—	0.5	0.3	0.3	0.13 min.	—	—	—	—
	Cadmium	0.005	0.005	—	—	—	—	—	—	—	—
	Iron	0.100	0.100	1.3	2.0	1.8	—	0.25 max.	0.15 max.	0.25 max.	1.5
PROPERTIES	Tensile Strength.	41,000	47,600	41,000	43,000	42,000	33,000	55,000	65,000	105,000	85,000
	Yield Point	None	None	23,000	26,000	23,000	21,000	30,000	35,000	60,000	65,000
	Impact Strength. (Charpy)	43	48	3.5	2.7	10.0	2(Izod)	33	36	30	—
	Elongation %	10	7	3.0	3.0	7.9	3	15	25	5	15
	Brinell Hardness.	82	91	—	—	—	60	120-130	120	190	160
	Specific Gravity.	6.6	6.7	2.76	2.68	2.53	1.81	8.5	8.6	8.2	8.45
	Melting Pt., F.	717.6	717.7	1090	1110	1160	1120	1650	1575	1564	1675

Iron has no detrimental effect on zinc castings. Arbitrarily, 0.1% has been set, but with good practice 0.2% might occur and remain in liquid solution; any excess would form iron compounds which would float and could be skimmed off There is a danger, however that these hard compounds might become entrapped in the casting and cause machining difficulties later.

Zinc alloys shrink about 0.001 in/in. upon solidification, a little less when air cooled than when water quenched. Complete shrinkage at normal temperature takes a few weeks (because of phase changes) but this may be accelerated when necessary by heating them to 212 F. and holding about 3-6 hrs. Alloy XXV will grow slightly in time, but as an extreme case, it takes two years of continuous exposure in dry air at 200 F. to return to the die dimensions.

Low temperature makes zinc castings harder, stronger and more brittle, but impact strength is usually adequate as evidenced by experience with automobiles in cold climates. High temperature improves impact strength and ductility and often aids riveting, swaging, bending or spinning when they are a part of manufacture. Tensile strength at 200 F. is about 70% normal and hardness about 60%.

Corrosion of zinc castings is roughly equivalent to that of galvanized coatings. Slight binding may occur in moving joints but where this is serious, it can be eliminated by treatment with the Cronak Process, controlled by NJ Zinc. Under ordinary conditions, hydrocarbons, alcohol, glycerine, ink, insecticides and cleaning fluids have little effect on zinc and many examples of its use under these conditions are in existence. Soap tends to inhibit corrosion, by forming a coating of zinc stearate and which keeps the surface smooth and slightly greasy. Dissolved zinc salts in moderation are not harmful to human beings, but as conditions vary so widely, food and beverage applications should be considered carefully.

ALUMINUM

The three most used aluminum alloys contain silicon, magnesium or copper and silicon. All contain 1-2% iron as impurity. Pure aluminum, because of low strength and poor casting qualities, is used only for electrical applications such as induction motor rotors where highest conductivity is important and strength is achieved by other means.

Copper gives strength and improves machinability when used in moderate amounts; silicon improves the fluidity and "castability." Magnesium in very small amounts tends to inhibit formation of eutectic chill flakes in the silicon alloys and when used as the only alloy ingredient, impact strength and machinability are very high, and specific gravity is slightly lower. There are many more alloys which will produce excellent castings. These three have been singled out because:

ASTM SC 6 (ALCOA A 380) (about 4% copper and 8½% silicon) is the lowest in cost at present and it has good all around properties for general-purpose casting.

SG 3 (ALCOA 360) is an aluminum-silicon alloy to which a little magnesium has been added (10% silicon 0.5% magnesium). Another, SG 2, is the same except for closer control over the iron impurity. These possess high corrosion resistance combined with easy casting and good machining qualities, although impact strength is a little lower than in the 4% copper alloy. The aluminum-magnesium alloy, G2 (ALCOA 218), containing 8% magnesium is the best from every standpoint except its castability which requires closer control and more care to produce good results.

MAGNESIUM

Containing about 8% aluminum for strength, and a little zinc and silicon for easier casting, the magnesium alloys and Alloy AZ 91 in particular are one-third lighter, one-fourth weaker (in tension), are the easiest of all die-castings to machine, are vulnerable to corrosion unless coated, and except for furnace procedure are about as easy to cast as aluminum. The favorable price and strength differential tends to offset the care and expense required in the melting procedure.

Eclipsaloy No. 130, developed by Bendix Aviation Corporation, with 1 to 1½% aluminum and ½ to 1½% manganese, balance magnesium, has the same yield strength as the 8-10% aluminum alloy, but a much higher impact strength. Corrosion-wise it is about the same, except that it doesn't lend itself to the superior Dow 7 coating treatment.

BRASS

High die cost and short die life because of the high melting point of brass have held back its use despite its superior strength and corrosion resistance. Here, forgings, sand castings and precision-investment or plaster-mold castings are still major rivals as the total volume of all these processes is relatively small.

LEAD AND TIN

The far-superior zinc has replaced lead completely in general purpose applications, but lead's peculiar corrosion resistance and high density are required for special work such as handling acids and stopping radioactive emanations. As lead is fatal to zinc alloys, most casters forbid its entrance, and take fantastic precautions against damaged or repaired castings which may contain solder. Even candy and cigarette wrappers with lead or tin foil can ruin a pot of zinc.

Tin is much the same story. Its properties are corrosion resistance, making it desirable for food containers, and bearing properties (the babbitts) but the latter die-casting application is now obsolete.

ALLOY SELECTION FACTORS

		COST		WEIGHT	STRENGTH		
	Quantity Die Cast	Cents per lb.	Cents per cu. in.	lbs/cu. in.	Equal Section	Equal Weight	Casting Troubles
ZINC	most	12	3	0.24	2	weakest	least
ALUMINUM	2	15	1.5	0.1	3	2	2
MAGNESIUM	3	20	1.3 (cheapest)	0.066	weakest	strongest	3
BRASS	least	30	9	0.31	strongest	3	most

If You Must Compare zinc with magnesium, say, keep terms consistent. Considering two structural castings of identical shape and size, one of each metal, the zinc cost will be about 2½, the weight 3½, and the strength 1½ that of magnesium. But overall operating cost is much lower, though hard to calculate, for zinc, and metal selection is too involved for simple statements

DIE-CASTING PRODUCTION CONTROL

A successful die-casting enterprise needs more than expertness in individual technical phases; it needs thorough integration based on sound planning and regulation. Of course, this is true of any manufacturing plant, but die casting, however small the physical layout, encompasses a wider variety of technical skills with the attendant need for a broader appreciation than found in many apparently-diversified metalworking establishments.

Probably one of the most important details, gradually increasing in recognition among die casters, and all foundry operations for that matter, is plain and simple good housekeeping. Dirt and other impurities are one of the surest causes of failure, and in a poorly-kept shop, alloy contamination can occur in all kinds of ways. Die casting is a clean process by nature, and if anything, it creates even less scrap than other kinds of metalworking. Tool and die shops, admittedly very clean, often have a die-casting machine or two near the other tools for the purpose of trying out new dies. The general atmosphere of such a plant is superior because its workers recognize and are accustomed to the need for cleanliness in all their work. A different problem is encountered when the general-purpose foundry annexes die casting to its facilities, but intelligent foundrymen are making rapid strides in improved environment in all their operations.

Controlled-quality die casting begins with controlled alloying procedure, and care to insure that good metal is not contaminated during casting. Specifications with tolerances have been laid down and precise effects of departure from these specifications are well known.

In a surprising number of cases, casting failure occurs long before the metal ever gets to the die. Gas poporosity, for instance, is often blamed on bad die design when the source of the trouble is much earlier. A pot of molten metal is liable to many diseases. Gas porosity can be caused by storing ingots in a damp location, which will result in oxidized metal and free hydrogen gas. Improper fluxing, direct contact with furnace gases and flames, adding cold metal to an already-melted pot, excessive stirring, overheating and excessive holding time are other reasons for gas porosity.

Iron contamination, from pot, stirrers, ladle and injection equipment is sometimes a source of trouble with higher melting-point alloys. Iron pots must be thoroughly and frequently cleaned and given a protective coating. One part sodium silicate, 6 parts mica wash and 8 parts water is the formula used by one outstanding firm. This coating can be applied to any iron implement which will come in contact with the melt. Some foundries use refractory or graphite-type crucibles for all aluminum work where the iron pick-up is most objectionable.

Re-use of scrap is practical and economical, but it must be pure scrap and free from fasteners, weld metal, solder or any foreign matter. (Beware of repaired castings.) Zinc's affinity for lead and tin, with disastrous results, has led many to take extreme precautions against foreign matter of any kind. It's cheaper in the long run not to take chances with doubtful metal.

Temperature should be controlled very closely. Too-hot or too-cold metal introduces ill effects over and above the hydraulics of cavity filling.

Indifference to these details through fear of higher costs or lack of appreciation of their importance is dangerous. They must be taken into consideration, and in the long run, close, continuous control will more than pay for itself in superior products and reduced scrap.

Inspection and Tests

Die castings are subjectable to the same tests as other castings and metal products. Radiography is commonly used to determine soundness, and specific gravity tests have been used also. The Zyglo fluorescent-penetrant method can uncover hidden or normally invisible surface flaws in non-ferrous castings. Physical strength is determined by actual use in the designed application and by the casting of standard test bars. The extent of testing procedures required is usually determined by the customer, based on the application of the product, and the majority of die castings are given a visual inspection only. When defective castings are found, through failure in simulated use or during inspection, the trouble can often be traced and corrected quickly.

After a die has been producing castings for a long time, inspection will begin to show a steady decline in the quality of surface finish, and usually, more and more flash, inaccuracies across the parting line and other flaws. There comes a time when finishing and machining costs begin to go up at a higher and higher rate, and a new die is definitely required. If production requirements can be determined in advance with any kind of certainty, the die or dies can be designed which will meet them with the greatest economy. If the requirement is found to exceed expectations, a safety factor will usually allow considerable stretching, even if the final castings aren't quite perfect, but it is usually better to overestimate the requirement than to underestimate it, except when design changes are unpredictable and likely to be frequent.

Die castings are little different from sand, permanent-mold castings, or forgings when it comes to machining, except that there's a lot less of it. The only important operation common to all die castings is trimming the flash, which is just like any punch-press operation. Precise-assembly requirements are built into the casting wherever possible by use of inserts and cored holes and cast-in lugs and rivets. Threads can be cast, but it's usually quicker, more accurate and cheaper to machine-tap the cored holes after casting.

Acknowledgment

Our thanks is extended to the following firms without whose assistance and suggestions this report could not have been written.

A-C Spark Plug Div. of General Motors Corp.
Aluminum Company of America
American Die Casting Institute, Inc.
Bendix Aviation Corporation, Eclipse Pioneer Division
The Cleveland Automatic Machine Company
Doehler-Jarvis Corporation
Dollin Corporation
The Dow Chemical Company
Fisher Body Ternstedt Div. of General Motors Corp.
Greater New York Die Casting Company
H. L. Harvill Manufacturing Company
The Hydraulic Press Manufacturing Company
Lester-Phoenix, Incorporated
The Lionel Corporation
The New Jersey Zinc Company
Reed-Prentice Corporation
Simplex Tool and Die Corporation

POLITICAL ACTION—
Labor's Blind Alley

THE approach of the 1948 elections brings organized labor in America to a fork in the road.

Straight ahead lies the familiar route of free collective bargaining. Except for an occasional side trip, labor has been traveling it for years. On this road the role of government is to act as traffic cop, removing obstructions for all travelers.

The fork is the road of political action—the road to special privilege for labor. On it government is called upon to clear a special right of way for organized labor—to push aside all others.

Which of these two roads will organized labor take?

Most American labor leaders are now urging their followers toward political action. Their first objective is to "get" all members of Congress who voted for the Taft-Hartley Act. AFL plans to raise a $5 million political combat fund through contributions and a per capita tax on its membership. CIO is soliciting $1 donations for political action from its 6,000,000 members.

For their own sake, however, as well as for the welfare of the country as a whole, the rank and file of organized labor will do well to stop, look and listen before they turn their unions into political action squads. If they examine the facts for themselves, they will make two significant discoveries:

I. Political action is a blind alley for labor.

II. The Taft-Hartley Act is an essential bulwark of free collective bargaining.

A brief discussion of these two statements will show what they mean to organized labor.

I

Political action is a blind alley for labor.

If there is any doubt about that statement, a good way to dispel the doubt is to look at European countries where organized labor has been following a political action line.

Britain, where the Labor Party is in power, is such a country. How is labor faring there? Measured by the good things money buys, the average hourly wage in Britain is less than two-thirds of what it is in the United States. Part of the difference may be accounted for by the fact that the British Isles are poorer in natural resources than the United States. Another reason is the war damage to Britain's plants.

But there are two other big reasons why the British wage earner is far behind the American worker in enjoying the good things of life:

1. The *incentive to produce* has been dulled by vote-catching programs which promise economic security and a levelling of incomes. Lulled by promises of cradle-to-the-grave security and discouraged by high taxes, the British have descended to a state neatly described by the London *Economist:*

"Nobody gains anything from activity or suffers anything from inactivity."

2. To run a program like Britain's requires more and more government functionaries. Civilian employees of the British government have increased by 50% since before the war, putting one worker out of ten on the government payroll. More and more people stop producing and spend their time instead cutting up what others produce. The result is smaller production, higher taxes and lower real wages.

The British Labor Party must accept most of the responsibility for this sorry state of affairs. It is due primarily to a program of political action by organized labor which promised the individual worker security and equality of income—*but which can not deliver either because the incentive to work is gone.*

The lesson for American wage earners is clear. Political action by unions to enforce the economic fallacy of more-and-more-for-less-and-less will end by impoverishing the working man—and bringing the nation to ruin.

Unions exist for collective bargaining, not for politicking.

II

The Taft-Hartley Act is an essential bulwark of free collective bargaining.

Bargaining works satisfactorily only when both parties—management and labor—think they are getting a fairly even break.

Management was very sure that the Wagner Act, as administered from 1935 to 1947, was giving employers the short end of the stick. Furthermore, management's feeling of frustration was no whim. It was justified by case after case where rights were granted to organized labor with no counterbalancing recognition of the rights of management, of individual workers or of the public.

The Taft-Hartley Act goes a long way toward establishing equality in employer-union relations. It may fall short of doing a perfect job. *As a subsequent editorial in this series will show, it leaves virtually untouched the public menace of industry-wide bargaining and labor monopoly. And it leaves unprotected what should be the individual's right to hold a job without joining any particular organization.* But it *does* provide some major safeguards for collective bargaining by striking at abuses.

Organized labor, therefore, has no cause to damn the members of Congress who voted for the Taft-Hartley Act. True, the law will check what has been an uninterrupted march of the labor union bosses toward absolute power. It will do so just as laws in the past—The Sherman Anti-Trust Act, for example—have checked management when it was too greedy. And, as the first section of this editorial points out, the time has come to check the march of the big labor bosses.

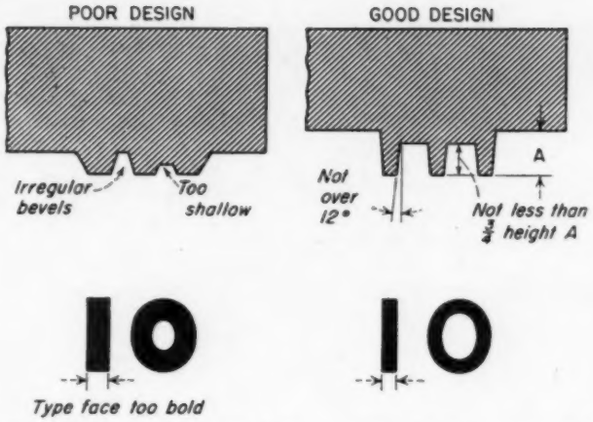
Fundamentally, the Taft-Hartley Act gives free collective bargaining a new lease on life. The old lease was running out because the Wagner Act stacked the cards against employers, against individual workers, and against the public.

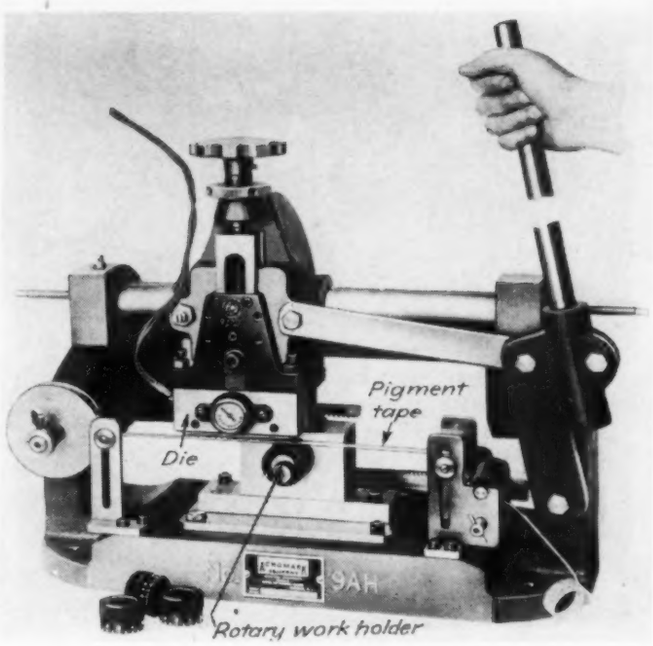
The road to free collective bargaining is now clear of many of the most menacing obstructions. It is the only road for labor to take in its own self interest. Union workers who let their leaders lure them down the blind alley of political action will do so at their own peril—and at the peril of this great industrial nation.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

THIS IS THE 63RD OF A SERIES





Proper engraving of the die is essential for successful marking, and narrow type faces produce optimum results. Flat dies are used for circumferential marking with a rotating workpiece (right). For marking flat surfaces of baked enamel coated parts, equally successful results can be obtained by the use of individual dies mounted in a rotary holder and rolled over the surface under suitable pressure

How to Mark Hard Plastics

BY H. O. BATES
THE ACROMARK CO.

ONE OF THE chief difficulties in the engraving of plastics and metals such as aluminum and magnesium has been the tendency of the material to tear or throw an objectionably heavy burr. That this can now be controlled to a greater or lesser degree is claimed by the Acromark Co., through the use of a process called Oil Engraving.* It is said to be particularly advantageous for use on thermosetting plastics as well as on the amorphous and crystalline thermoplastics, and to handle hitherto impossible jobs on aluminum.

In practice, the metal or plastic is immersed in a thin oil during the engraving process. This may be supplied in a stream constantly flooding the cutter point, or better still, the work may be immersed in a bath on the engraving table of sufficient depth to fully cover it and the tool point. Brittleness in the material does not result in appreciable chipping at the edges of the cut, nor does burring occur to as great a degree as by any other method. In most metals and plastics, chipping and burring is eliminated, leaving a smooth-edged cut which lends itself readily to a later filling process.

Delicate instrument parts, dials, scales, measuring tools and other calibrated metal or plastic components can thus be successfully marked by engraving with a high degree of precision. This same method can also be used for engraving plastic-, resinous-, or baked-enamel coated and Alumilited metals.

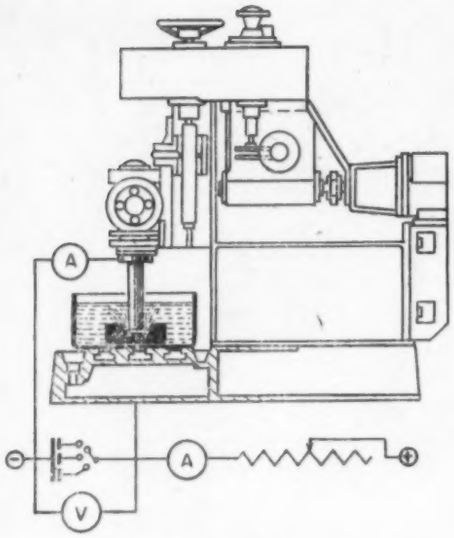
In the manufacture of stamping dies for marking baked-enamel finishes and plastics, common practice has been to engrave the dies with a face to suit the width of character desired. This frequently produces imperfect marking on exceptionally hard or brittle surfaces to the extent that it has been necessary to resort to engraving the mold at considerable expense and inconvenience. If, however, the width of the character lines is varied in relation to the brittleness of the work, excellent results can be obtained in both hot and cold stampings. Certain very brittle plastics, and baked enameled finishes on brass and aluminum, cannot be successfully stamped in the cold state, but they can be marked if the dies are properly engraved and the correct degree of heat applied to the die. In some cases it is also necessary to apply a definite temperature to the plastic itself.

To achieve these results, the die steel must be of sufficiently high carbon content that it will take Flint Hardness* and hold it even when the necessary heat for hot stamping is constantly applied, and the dies must be exceptionally deeply engraved, with characters of true form.

For characters up to ⅛ in. high, the depth of engraving should be at least three-quarters the height of the character; for ¼-in. characters the depth should be 5/32 in.; for ⅜-in. characters, 3/16 in.; and for ½-in. characters, ¼ in. Hand-finishing the edges of the character faces creates the most disastrous condition, a broad and usually irregular bevel. The face must be ground after hardening to present a finished surface with sharp edges on all characters.

Stamping machines must be rigidly constructed, with sufficient strength to resist the substantial forces applied in marking. For cylindrical objects, the die should be flat and should be rolled across the work, which is free to rotate. For flat work, the die should be cylindrical. This permits the impressing of only one axial line of character face at a time as the die advances, and places a minimum strain on the work. If color is to be used for filling the characters, care must be taken in selecting a suitable pigment tape to bind with the enamel or plastic at a specific temperature. Interposing a color tape between the work and the die gives a much more satisfactory method of filling than the common way of coating the stamped part with paint and wiping off the excess.

Exclusive Acromark designation.



Electric erosion drillpress of the so-called contact type in which the tool is caused to vibrate rapidly, making and breaking contact with the workpiece

MACHINING BY EROSION

New Russian machine tools are said to form holes to almost any shape and to dress tools without causing surface flaws

BY B. R. AND N. I. LAZARENKO

SIMILAR in principle to the electric disintegration method used for removing broken taps or for drilling hard metals, a new type of machine tool has been developed in the USSR. Announcement in *American Machinist* (May 8, 1947) brought requests for details, obtained by McGraw-Hill World News.

The drilling machine consists essentially of a vibrating, but not rotating, spindle to which a tool of almost any desired shape may be attached. An eccentric, belt driven by an electric motor, raises the spindle 1 mm., the return being effected by a spring inside the spindle. The tool, or electrode, is usually brass, and is rigidly attached to the spindle but carefully insulated from it. Spindle feed is operated by a separate dc. variable-speed motor operating through a double-worm reducing gear with a ratio of 1:360. A three-speed gear box makes possible additional speed changes in the ratio of 3:1, 1:1 and 1:3. Manual feed is also available through the medium of a separate handwheel.

Electrical controls, mounted in a separate control panel, consist of a variable resistance for changing intensity of the current between 1.3 and 30 amp. and condenser switches for varying capacity of the oscillating circuit between 2 and 500 mf. Electrical and mechanical systems are interconnected.

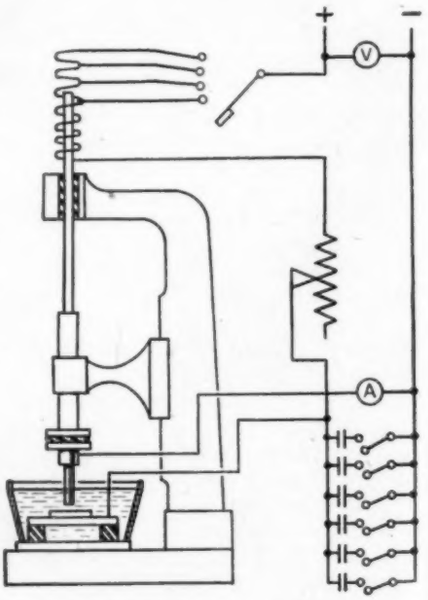
Work is clamped in a suitable fixture and immersed in a bath of oil or kerosene of sufficient depth to cover it by at least 100 mm. Capacity and resistance of the electric circuit is adjusted to suit the particular conditions. Vibrator and feed motors are switched on, and current supplied to the discharge circuit.

Rate of feed is the only element subject to control while the machine is in operation, because it is essential to maintain constant clearance between tool and the work, and its selection depends on the readings of the mean working current of the oscillating circuit. If feed falls behind, the current drops from mean to zero; if it is ahead, current tends to reach its maximum. Advantage is taken of this to operate an automatic feed control by means of a special relay incorporated into the feed circuit and adjusted to the mean value of the working current. This relay reacts to any deviations from the mean by switching the feed motor on or off. The circuit is intended only for corrective purposes, the gear box being used to select the correct feed rate; otherwise excessive wear of the relay will occur. Maximum power consumption is 2.5 kw., including 0.25 kw. for the vibrator motor and 0.25 kw. for the feed motor.

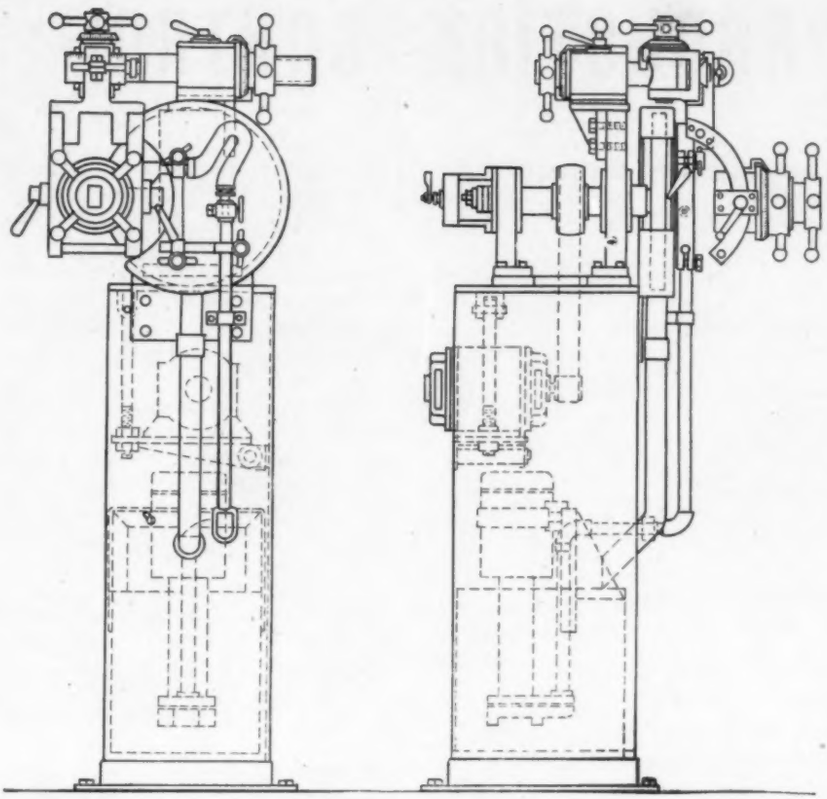
Another, and simpler machine, has been built by converting an ordinary bench drillpress. This is described as a non-contact type of machine in which the discharge circuit is closed by rupture of the interelectrode space, i.e., there is no vibration system. The spindle drive was removed, and the regular spindle bushing replaced by one made of insulating material. A bath was installed on the machine table, and this, too, was insulated from the machine frame. The electrical system is identical to that of the other machine, the discharge circuit ends being connected to the machine chuck on the side of the tool, and to the bath on the side of the workpiece.

The tracing system of this type of machine performs the function of direct control of the feed, effected by means of a solenoid inserted into the feed circuit and placed over the spindle shank. Machines of this type are particularly recommended because, while very simple in design, they operate automatically and can perform many operations.

Tool grinding can also be performed by the electric erosion process, using a rotating wheel which consists of electrodes in a tuned discharge circuit. The tool to be ground is secured in a special tool-holding head by turning the inner journal bearing of the head until the clamp lugs rest against the tool body. When the tool is gripped, the journal bearing of the head is tightly locked. The tool is located in such a way that its tip protrudes 82 mm.



Converted from a standard drillpress, this non-contact type of machine uses a solenoid-operated feed mechanism, but does not require vibration of the spindle



Tool sharpening can be performed by this machine which employs a rotating metal disk for electrically eroding the tool surface. Burning and checking is said to be eliminated

toward the wheel. This is checked by means of a special gage. To facilitate grinding all the required faces and edges, the tool-holding head can be given the following six independent movements:

1. Rotary, around the geometrical axis of the tool, 360°.
2. Turning in a vertical plane from horizontal to 15° upwards and 15° downwards, with the center of rotation at the point of the tool.
3. Rotation around the vertical axis passing through the point of the tool to allow for setting up the tool in a plane normal, parallel and inclined to the wheel surface.
4. Displacement of the head with the tool in the vertical axis of rotation by 30 mm. to right or left from the middle position parallel to the wheel surface. This is important when grinding right-hand or left-hand tools.
5. Movement of the entire system of the head and tool so the tool impinges on and can be withdrawn from the wheel.
6. Transfer of the entire system of the head parallel to the wheel surface so the tool end approaches the periphery. This allows for processing the side and upper edges of the tool to desired length.

The movements described above allow for all ordinary tool angles, and for grinding roughing, threading, parting, and recessing tools, as well as right- and left-hand tools. The tool is processed near the horizontal diameter of the wheel, close to the periphery, and also on the face.

The clamping lugs of the head are made from an insulating material and are capable of holding rectangular tool shanks 16x25 or 20x30 mm. By changing the lugs, or using another head with higher lugs, it is possible to grip tools 16x25 or 12x20 mm. Square-shank tools can also be used.

The wheel is mounted on a hollow spindle, driven by an electric motor at 500 rpm. Inside the spindle is a rod, insulated from the spindle body by textolite bushings. The wheel is secured to a thread on the end of this rod. A nut on the other end of the rod fixes this in the spindle. The wheel is surrounded by a case made from transparent plastic which both permits observation and prevents the metallic particles resulting from the operation from causing a short circuit between the wheel and the case body. Water is fed to the point of contact between wheel and work, and the case acts also as a splash guard.

Wires from the control panel are connected to the wheel through a copper-graphite brush bearing against the end of the rod farthest from the wheel, and to the tool through a contact inserted in one of the clamp lugs.

The electrical system of the machine consists of elements inherent in any spark-action installation. The variable resistance permits adjustment of the current intensity between 0.1 and 30 amp., and switching the condensers varies the capacity of the oscillating circuit from 2 to 400 mf. To provide various working conditions from roughing to finishing, both the rheostat and the condensers must be switched over in the course of the work. For this purpose the machine is equipped with a special pedal by means of which both the capacity and the resistance can be simultaneously switched over. As soon as the pedal is released, current is switched out of the entire system to permit change-overs with the circuit open.

TIPS FOR TOP SHOP MEN

211 Watch for the bully who "picks on" apprentices, helpers, messengers and others smaller or younger than he is. He's yellow and the type who'd steal a baby's candy. Most of all, be sure you aren't open to the same criticism.

212 Ever think that you — and those who work for you— spend more waking hours on the job than they do anywhere else? That makes *you* a logical choice for friend and counselor. What are you doing to deserve the selection?

213 Be an apostle of change to protect yourself against the common slide into the "that's how we've always done it" attitude. Change brings progress; following the established method may perfect mistakes or insure stagnation.

214 Indians have a saying: "The way to cross a river is to cross a river." In other words, if a job is to be done, a little planning will help, but don't spend so much time planning that the job doesn't get done.

JOB-SHOP PRODUCTION CONTROL

Large volume of shop orders, most of small quantities, is a common job-shop problem. Saranac solved it by relatively simple combined wage-incentive and production-control system

BY HAROLD W. NEWHOUSE
Supervisor of Process Engineering
SARANAC MACHINE CO.

Quantity Ordered: 100	Quantity Finished	Type or Mach.: #1 C.J.F.	PART NAME: MOVABLE KNIFE	Part No.: 92-T-1	Order No.: M-23622
Tool Set No.				Pattern No.	Date: 8-15-46
P.E.R.	Std. Lot Size	S.U. Cost per Pc.	Drawing Date / Released to Fact'y / Scheduled to Start / Dept. No.: 24	Sched'd to Fin. / Finished on	Quantity
Quantity: 100	Size or Patt. No.	MATERIAL DESCRIPTION: 3/8" X 7/8" X 2-1/8" Col. #7			
From				Wt. or Unit Cost	Total Cost

DM Form 501 — Sheet 1 of 3 Sheets — **SARANAC MACHINE CO. ROUTE SHEET**

Allowed Hours: Set Up	Allowed Hours: Cycle	Oper. No.	Dept. No.	OPERATION DESCRIPTION	Speed	Feed	Cuts
			105	Stock to first oper. (S-1-7)			
0.531	0.092	10	24	(S-1-7) (S-1-7) (4" universal face mill)			
				Mill clean up cut on one edge	195	4½	2
				Mill opp. edge to width, burr			
0.097	0.093	15	24	(S-1-7) (S-1-6) (4" universal face mill)	195	4½	2
				Mill clean up cut on one side			
				Mill opp. side to thickness			
				Allow for grind, burr			
0.576	0.009	20	24	(S-1-6) (S-1-7) (4 X 5/8 X 1 1/4 X 20 T side mill)			
				Mill to length in fix. #466-F,	57	2.5	1
				15 @ time, burr			
0.621	0.061	25	24	(S-1-7) (S-1-7) (5/8" end mill)			
				Milling fixture #868-F,			
				Mill 26° cutting edge with 5/16" R.,	322	1 3/8	1
				Burr			
0.349	0.060	30	24	(S-1-7) (S-1-7) (5/8" end mill)			
				Milling Fix. #868-F,			
				Mill 15° angle, burr	322	1 3/8	1
Department No.							
Cycle Time per Pc.							
Total Allowed Hrs.							

Typed master route sheets, prepared for each part by the methods analyst, go to a time-study analyst, who adds time allowances, speeds, feeds, number of cuts and standard tool data in pencil. A hectograph master is copied from this sheet by production control to reproduce shop orders, time tickets, move tickets and material requisitions

PRINCIPAL products of Saranac Machine Co. are assembling and stapling machines for wood crates and baskets. These machines vary considerably in design and construction to suit customers' requirements. In addition, a wide variety of metal products are made under subcontract.

The result: production orders in the machine shop vary in quantity from 1 to 3,000 parts, with the largest volume of orders in the range from 10 to 25 parts. More than 11,000 different standard parts are carried in stock.

Obviously, production control is complicated by the large volume of different production orders being worked on in the shop at the same time. In fact, until 1942 no attempt was made to apply modern production-control methods because it was felt that any system selected would necessarily be too complicated to justify the expense involved.

Control Imperative During War

Subcontract orders, entered early in the war, made imperative the installation of an effective control system for routing work through the shop. Installation of a satisfactory wage-incentive system also became desirable. Therefore, a firm of management consultants was called in to analyze the problems involved and to install a tailor-made system in which production control and wage incentives were carefully correlated.

The combined production-control and wage-incentive system, developed for us by McClure, Hadden & Ortman, Inc., includes the careful analysis of all shop orders by methods and time-study analysts before they are written.

Setup and cycle time allowances are determined from standard time data developed originally by the consulting firm and brought in line with our methods by check stop-watch time studies made during development of the system. These standard data have been kept up-to-date by making occasional stop-watch time studies of operations not covered by standard data.

By using standard time data, supplemented only where necessary by stop-watch time studies, we have found that one time-study analyst

Quantity Ordered	Quantity Finished	Type of Mach.	PART NAME	Part No.	Order No.
100		#1 C.J.F.	MOVABLE KNIFE	92-T-1	M-24972
Tool Set No.				Pattern No.	Date 3-12-47
	Std. Lot Size	S.U. Cost per Pc.	Drawing Date / Released to Pact'y / Scheduled to Start / Dept. No.	Sched'd to Fin.	Finished on / Quantity
P.E.R.			3-12-47 / 24		
Quantity	Size or Patt. No.	MATERIAL DESCRIPTION			
100		3/8" X 7/8" X 2-1/8"			
From				Wt. or Unit Cost	Total Cost

SARANAC MACHINE CO.

Sheet ___ of ___ Sheets

Form 501 (10M) 8-46

ROUTE SHEET

			Allowed Hours Set Up	Allowed Hours Cycle	Oper. No.	Dept. No.	OPERATION DESCRIPTION	Speed	Feed	Cuts
							USE MASTER 92-T-1			

This form, actually the heading of the regular route sheet, is used when use of an old master route sheet for a new order is approved by process engineering

Quantity Ordered	Quantity Finished	Type of Mach.	PART NAME	Part No.	Order No.
100		#1 C.J.F.	Movable knife	92-T-1	M-24972
Tool Set No.				Pattern No.	Date 3-12-47
	Std. Lot Size	S.U. Cost per Pc.	Drawing Date / Released to Pact'y / Scheduled to Start / Dept. No.	Sched'd to Fin.	Finished on / Quantity
P.E.R.			3-12-47 / 24		
Quantity	Size or Patt. No.	MATERIAL DESCRIPTION			
100		3/8" X 7/8" X 2-1/8" Col. #7			
From				Wt. or Unit Cost	Total Cost

SARANAC MACHINE CO.

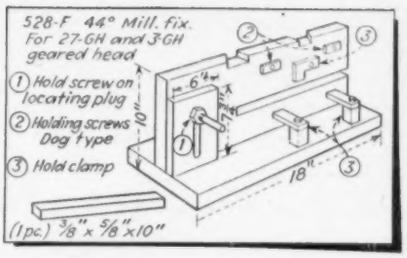
Sheet ___ of ___ Sheets

Form 501-B (10M) 7-46

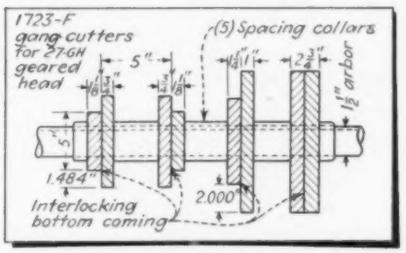
ROUTE SHEET

A new heading is typed to block out the old heading when an old master route sheet is used for a new shop order. This arrangement permits use of old masters many times unless methods or tools are changed

Route sheets, material requisitions, move tickets, tool tickets and operation time cards are reproduced from master route sheet with a Standard fluid duplicator. Each individual ticket reproduces the heading from the route sheet as well as the data for each individual operation



Special tools are recorded on 3 x 5-in. cards so methods and time-study analysts can analyze tool setups without need for visit to tool crib



Special gang cutter setups also are recorded on 3 x 5-in. tool cards filed in the process-engineering office

Former 91-GJ-6

Order No.		Quantity	Date	Processed
S-90803	Not Rec'd. by P.E.	3	10-4-46	Rel. to Mfg. by Prod.
M-23815	Not Rec'd. by P.E.	6	10-4-46	Rel. to Mfg. by Prod.
S-90911		6	10-9-46	10-9-46
S-90810	Not Rec'd.	5 Rd	10-15-46	Rel. to Mfg. by Prod.

Shop orders issued by production control are recorded on 3 x 5-in. cards in process engineering. Of orders shown, only No. S-90911 was reviewed by methods and time-study analysts. Periodic review insures use of up-to-date tools and methods

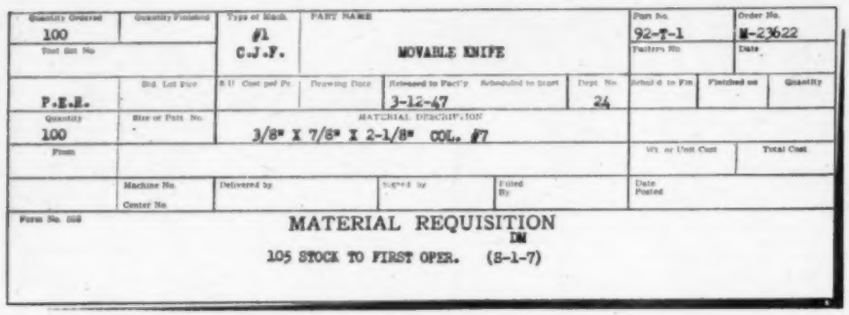
can determine rates for 15 times as many operations as with the straight stop-watch method. In addition, allowed values are more consistent and therefore fairer to production workers in the shop. Today, three time-study analysts easily can set about 950 time allowances in a 40-hr. week.

Two shop departments, process engineering and production control, have charge of the combined production-control and wage-incentive system. The process-engineering department employs one supervisor, one methods analyst, three time-study analysts and two clerks.

Its duties are:

1. To prepare all master route sheets.

2. To determine what machine



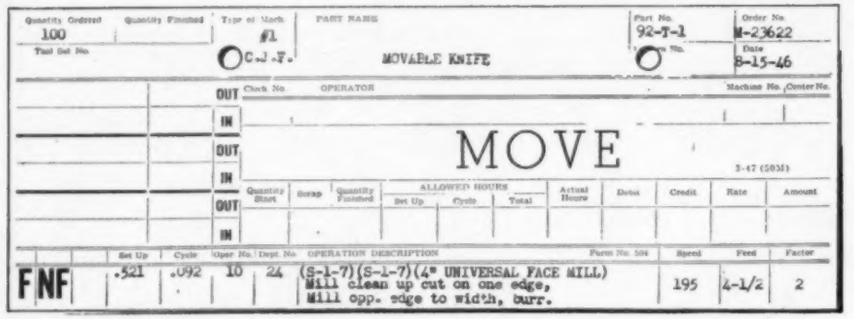
Quantity Ordered	Quantity Finished	Type of Mach.	PART NAME	Part No.	Order No.
100		#1 C.J.F.	MOVABLE KNIFE	92-T-1	M-23622
Tool Set No.				Pattern No.	Date
Bldg. Lot Floor	S.U. Cost per Pr.	Drawing Date	Released to Part'y / Scheduled to Start	Dept. No.	Scheduled to Finish / Finished on / Quantity
P.E.E.			3-12-47	24	
Quantity	Size or Patt. No.	MATERIAL DESCRIPTION			
100		3/8" X 7/8" X 2-1/8" COL. #7			
From				Wt. or Unit Cost	Total Cost
	Machine No. / Center No.	Delivered by	Signed by	Filled By	Date Posted

Form No. 502

MATERIAL REQUISITION

IN

105 STOCK TO FIRST OPER. (S-1-7)



Quantity Ordered	Quantity Finished	Type of Mach.	PART NAME	Part No.	Order No.
100		#1 C.J.F.	MOVABLE KNIFE	92-T-1	M-23622
Tool Set No.				Pattern No.	Date 8-15-46

OUT / IN / OUT / IN / OUT / IN — Clock No. — OPERATOR — Machine No. / Center No.

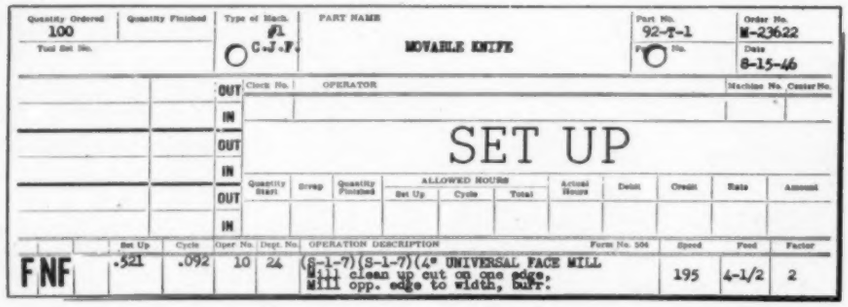
MOVE

3-47 (503M)

Quantity Start	Scrap	Quantity Finished	ALLOWED HOURS Set Up	Cycle	Total	Actual Hours	Debit	Credit	Rate	Amount

	Set Up	Cycle	Oper. No.	Dept. No.	OPERATION DESCRIPTION	Form No. 504	Speed	Feed	Factor
FNF	.521	.092	10	24	(S-1-7)(S-1-7)(4" UNIVERSAL FACE MILL) Mill clean up cut on one edge, Mill opp. edge to width, burr.		195	4-1/2	2

For each shop order, a material requisition ticket and a move ticket are delivered to the material-control office. Delivery of material to the first work station is reported to the dispatcher by arrival of move ticket on his desk



Quantity Ordered	Quantity Finished	Type of Mach.	PART NAME	Part No.	Order No.
100		#1 C.J.F.	MOVABLE KNIFE	92-T-1	M-23622
Tool Set No.				Pattern No.	Date 8-15-46

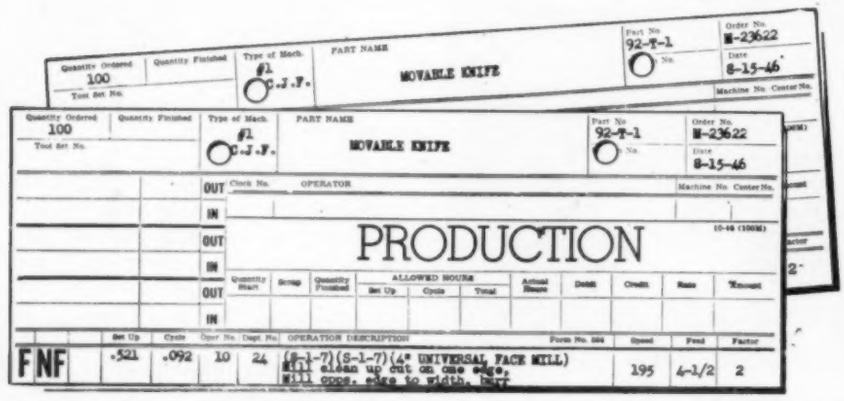
OUT / IN / OUT / IN / OUT / IN — Clock No. — OPERATOR — Machine No. / Center No.

SET UP

Quantity Start	Scrap	Quantity Finished	ALLOWED HOURS Set Up	Cycle	Total	Actual Hours	Debit	Credit	Rate	Amount

	Set Up	Cycle	Oper. No.	Dept. No.	OPERATION DESCRIPTION	Form No. 504	Speed	Feed	Factor
FNF	.521	.092	10	24	(S-1-7)(S-1-7)(4" UNIVERSAL FACE MILL) Mill clean up cut on one edge, Mill opp. edge to width, burr.		195	4-1/2	2

Production control, for each operation on which setup time is allowed, prepares a salmon-colored setup time ticket



Quantity Ordered	Quantity Finished	Type of Mach.	PART NAME	Part No.	Order No.
100		#1 C.J.F.	MOVABLE KNIFE	92-T-1	M-23622
Tool Set No.				Pattern No.	Date 8-15-46

OUT / IN / OUT / IN / OUT / IN — Clock No. — OPERATOR — Machine No. / Center No.

PRODUCTION

Quantity Start	Scrap	Quantity Finished	ALLOWED HOURS Set Up	Cycle	Total	Actual Hours	Debit	Credit	Rate	Amount

	Set Up	Cycle	Oper. No.	Dept. No.	OPERATION DESCRIPTION	Form No. 504	Speed	Feed	Factor
FNF	.521	.092	10	24	(S-1-7)(S-1-7)(4" UNIVERSAL FACE MILL) Mill clean up cut on one edge, Mill opp. edge to width, burr		195	4-1/2	2

Production time tickets, two or more, are reproduced on yellow cards for each production operation shown on the route sheet. A different time ticket is required for each operator working on the job

tools, accessory tools and equipment should be used to make each part.

3. To determine what time allowances are to be applied to each shop operation.

4. To determine when changes in production activity for any given part justify changes in methods or the construction of improved jigs and fixtures.

Process engineering handles an average of 95 master route sheets each week, each involving about ten incentive operations. It also is responsible for operation of all tool cribs and maintenance of all tool records. But these activities involve a group of employees other than those mentioned.

The production-control office schedules all shop operations. It prepares shop order copies of the route sheet, material requisitions, time cards and move cards, and operates the two dispatcher's offices.

Production control also maintains an Order Progress Record Book in which an entry is made for each movement of a shop order—to the engineering department for checking, to process engineering for routing, to shop schedule clerk, to each shop operation, and to the stores or assembly—in order that the status of each shop order can be determined quickly.

Standard stock parts are held at required quantity levels by perpetual inventory control, maintained by the stores department. Orders for replacement of stock parts are initiated by the production-control office, these orders being routed through the engineering department so up-to-date specification sheets (bills of material) and parts prints can be attached to the order.

New Order Procedure

Orders for new machines and contract work are routed through engineering from the sales department before delivery to the production-control office.

When a new order is entered, whether for a new machine, contract work or replacement of stock parts, the engineering department sends a copy of the original order, parts prints, specification sheets and assembly drawings to production control.

The order is entered in the Order Progress Record Book, and stock parts are checked off on the specification sheets because new route sheets usually need not be prepared for stock items.

Specification sheets, showing non-stock parts, and parts drawings for such items are sent to process engineering so master route sheets can be prepared for these parts. Sheets and drawings go first to the methods analyst who writes the route sheet after determining the operations to be performed in making the parts, proper sequence of these operations, machine tools or other production units to be employed, and jigs, fixtures and special cutting tools to be made or secured from other operations.

To aid him in his work, the methods analyst has a book of data sheets for each machine in the plant, showing available speeds and feeds, worktable size, range of movement of tables and tool or work slides, and similar information.

He also has a file of 3 x 5-in. cards on which are recorded individually all special jigs, fixtures and other tools made for the various parts. These tools are sketched so a motion analysis can be made in process engineering without need for the analyst to go out to the shop to see the tool.

Another file of 3 x 5-in. cards records each shop order issued by production control. These cards, filed by parts number, are used to determine when parts should be stocked be-

Quantity Ordered: 100 | Quantity Finished | Type of Mach.: #1 C.J.F. | PART NAME: MOVABLE KNIFE | Part No.: 92-T-1 | Order No.: M-23622 | Date: 8-15-46

Tool Order

Set Up	Cycle	Oper. No.	Dept. No.	O... A...n DESCRIPTION	Form No. 503	Speed	Feed	Factor
.521	.092	10	24	(S-1-7)(S-1-7)(4" UNIVERSAL FACE MILL) Mill clean up cut on one edge, Mill opp. edge to width. burr.		195	4-1/2	2

Tool-order ticket is prepared by production control where route sheet indicates that tools are required on an operation. When the dispatcher wants tools delivered to the work station, he sends this ticket to the tool crib

Quantity Ordered: 100 | Quantity Finished | Type of Mach.: #1 C.J.F. | PART NAME: MOVABLE KNIFE | Part No.: 92-T-1 | Order No.: M-23622 | Date: 8-15-46

OUT / IN — Clock No. | OPERATOR | Machine No. | Center No.

P-E-R. — 3-12-47 — 24

100 — 3/8" X 7/8" X 2-1/8" Col. #7 MOVE

Quantity Start	Scrap	Quantity Finished	ALLOWED HOURS Set Up	Cycle	Total	Actual Hours	Debit	Credit	Rate	Amount
					IM					

Set Up	Cycle	Oper. No.	Dept. No.	OPERATION DESCRIPTION	Form No. 504	Speed	Feed	Factor
F NF			105	STOCK TO FIRST OPER. (S-1-7)				

A move ticket is prepared on a red card for each operation listed on the route sheet and given to the moveman by the dispatcher when a production operator reports he has completed a job

All setup, production, tool order and move tickets, delivered to the dispatcher when the order is issued, are filed according to machine number and operation number until needed by the dispatcher for operations ready to be put in process

cause of high activity, or when increased activity justifies more expensive tools which will permit lower unit manufacturing costs.

The process-engineering office handles all estimating on contract work as well as on new machines, using the same standard data for estimating as for setting time allowances for shop operations.

All operations necessary to complete a given part, including operations on which incentive time allowances are not made, are listed on the route sheet. Included are such operations as heat treating, checking hardness, cleaning and polishing, final inspection and delivery to stock.

In each operation listed, machine number or work station is shown, as well as machine number or work station on which the next succeeding operation is to be performed. This makes it possible to prepare a move ticket for each operation directly from the route sheet, without showing both operations on the same move ticket.

When the route sheet has been prepared by the methods analyst, he

PART NO.	OPER. NO.	OPERATION	MACH. NO.	TOOL SET NO.
91-UJ-1-2	5	Mill	S-1-6D	

INTERCHANGEABLE ON — Form No. 847

PART NO.	PART NO.	PART NO.	PART NO.	PART NO.	PART NO.	PART NO.	CARD NO. 1 of 1 CARDS

QTY. TOOLS	ITEM NO.	SET OR SYMBOL NO.	DESCRIPTION OF TOOL	CHECK IF STD. TOOL	TOOL CRIB LOCATION SEC.	TIER	BIN	DATE USED	CLOCK NO.	DATE RET'D.
1		T	Head 1267F Gang Cut		4	9	1A	On Arbor		
1			45 Ang. Plate (1-3/8 x 5)							
1			3/4" Sq x 6" U Clamp							
2			5/8" x 10" Bolts, Nuts & Washers							
2			T Slot Nuts to Fit Machine							
1			4" Stop							
1			3" Stop							

SYMBOLS — "T" FIXTURES & JIGS — "T" TOOLS — "G" GAUGES & TEMPLETS — "D" DIES — SARANAC CRIB AUTOMATIC CRIB

Each tool crib has a file of tool record cards on which are listed special and standard tools required for each operation on a given part. When a tool ticket is sent to the crib by the dispatcher, the attendant pulls the tool card and delivers listed tools to specified machine

A dispatch board, in each of the two dispatcher's offices, has a space for each machine. Cards for "jobs ahead" are placed in pockets on this board in front of the hooks on which "active" job tickets are hung. Production workers come to the dispatcher's office to check in and out on the time tickets which are sent to the accounting department when the job is finished

passes it along to one of the time-study analysts in the same office. The time-study anlayst records in pencil on the route sheet the setup and cycle time allowances, speeds, feeds, number of cuts and standard cutting tools to be used for each of the operations listed by the methods analyst. Methods and time-study analysts work closely together to establish what they mutually agree is the best method under existing conditions for making each part.

Route sheets are prepared for all parts made in the plant, whether standard stock parts or special parts. These route sheets are filed in the production-control office for use when needed.

When production control gets an order to make parts duplicating those for which route sheets previously have been prepared, they can issue new shop orders by rerunning old master route sheets with new headings, provided that the master route sheets show dates indicating that they have been checked by process engineering within the last three months.

Otherwise, a new order must be routed through process engineering to determine whether methods or routing have been revised in the meantime. This procedure has the added advantage of forcing a continual review of methods by process engineering. No parts are made by obsolete methods just because someone failed to bring the shop order to the attention of the methods or time-study analysts.

When master route sheets have been approved by the supervisor of the process-engineering department, they are sent to production control for retyping and for duplication of job order copies and individual operation tickets. Master route sheets are typed with hectograph ribbon for reproduction with a Standard fluid duplicator.

Route-Sheet Distribution

Usually, six copies of the entire route sheet are reproduced for each shop order. Three copies are reproduced on white paper, one for the order envelope, one for the dispatcher and one for filing in the production-control office.

In addition, a copy is made on yellow paper for the cost department, one on green paper for the stock room and one on the reverse side of the Work Progress Report maintained by the inspector for each shop order. This copy of the route sheet also is placed in the cellophane envelope which accompanies each shop order from operation to operation until all work has been completed. A blueprint of the part also is kept in this envelope.

The material requisition and a red move ticket is then run off from the top section of the route sheet. These two tickets, together with the cellophane shop-order envelope, are delivered to the material-control office so parts can be delivered to the first machine listed on the route sheet. When the material is delivered to the first machine, the move card is given to the dispatcher to notify him that the shop order shown on the card is ready to schedule.

For each operation listed on a route sheet, the production-control office reproduces (1) a setup time card if the time-study analyst has

allowed setup time on the route sheet, (2) at least two (sometimes more) production time tickets, depending on the number of hours of work involved, (3) a tool-order ticket for all operations requiring tools and (4) a move ticket. These tickets, together with a copy of the route sheet, are sent to the dispatcher at the same time that the material requisition is sent to the material-control office.

The dispatcher files the time cards, including the setup, tool-order and move tickets, in card files by machine number or work station number. Here they are held in "dormant" groups until parts are ready for the operations shown on the tickets. This is indicated by receipt in the dispatcher's office of the move ticket for the preceding operation.

When the preceding operation has been completed, tickets for a given operation are transferred to a "ready" group. From this file, tickets for the next operation to be performed on a given machine or work station are moved to a pocket on the dispatch board.

At the same time, the tool ticket from this group of tickets is sent to the tool crib so tools can be selected and delivered to the machine or work station before they are needed.

Cards for "active" jobs are hung on hooks on the dispatch board, one set of hooks being provided for each machine or work station in the shop.

Tools Delivered to Machines

When a tool ticket reaches the tool crib, the attendant pulls the tool card for the part and operation number shown on the ticket. Tools listed on this card are drawn from the crib and delivered to the machine. The tool ticket then is initialled by the crib attendant and returned to the dispatcher as notification that tools are ready and delivered.

Tools are charged to the machine, not to the operator. The system would be complicated by any requirement that tools be accounted for at the end of each shift if the operation is to be run on more than one shift.

Tools are returned to the crib at the end of an operation by the moveman, who picks up the tools at the same time that he picks up the parts for delivery to the next work station. Return of tools to the crib is considered a part of the "move" operation.

Each production worker goes to the dispatcher's desk to check in and out on the time cards, which are kept on the dispatch board. At no time is a time card removed from the dispatcher's office until the work shown thereon is completed.

When an operation is completed, the move ticket, so far kept with the operation time ticket, is put in a box for the moveman to pick up as his authorization to move parts to the next machine or station.

He returns this card at the end of the move to the dispatcher, who then checks the operation off on his copy of the route sheet and sends the move card to production control so individual operations can be checked off in the Order Progress Record Book. Completed time cards for individual operations are delivered to the cost-accounting office by the dispatcher.

When a machine operator is delayed for some justifiable reason, his supervisor gives him a green ticket authorizing the dispatcher to charge time against a shop order

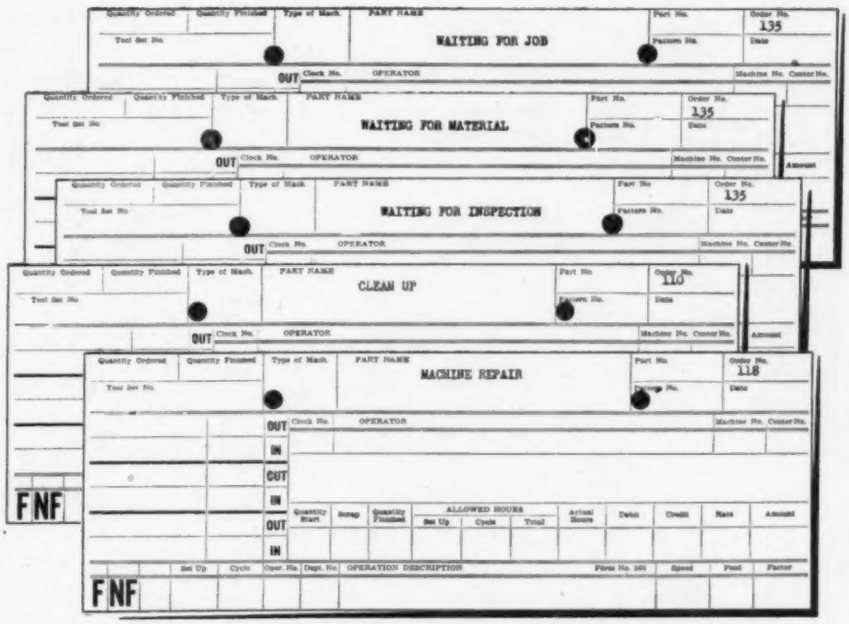
SARANAC MACHINE CO.
SUPERVISOR'S AUTHORIZATION TO WORKMAN
To Work on the Following

Form 520 — Date 3/12/47 — Check √

Set-Up	✓
Machine Repair	
Clean-Up	
Stock Room	
Maintenance	
Waiting for Inspection | Insp. Sign	
Waiting for Job	
Waiting for Material	
Waiting for Set-Up	
Cutter Sharpening	
Route Sheet Lost	
Cutter Change	

Operator No. 1312 — Temp. Transfer To Dept. — Supervisor J.C.D.

Where production operations are delayed through no fault of the workers, supervisors issue work authorization tickets. Delivery of ticket to the dispatcher authorizes the worker to check in on a special time card chargeable against a shop expense order



The dispatcher has available a supply of time tickets for "waiting" charges authorized by shop supervisors. These tickets are hung on the dispatch board in place of production time tickets when production work is delayed

SARANAC INDUSTRIES

Request for ☑ Scrap ☐ Re-work Order

NOTE: To be made out in Duplicate and sent to Production Office with Route Sheet.

S.R. No.

S.R.A. No. 1745

Date 3/10 194 7

Ordered by ____ O. K. by ____ Scrap Caused on Order No. M-24911

Error by R. JONES Clock No. 1312 Dept. 24

Reason 15° ANGLE NOT IN LINE WITH OPPOSITE SIDE

Oper. No. 30

QTY.	PART NO.	PART DESCRIPTION
5	92-7-1	MOVABLE KNIFE

I hereby acknowledge responsibility for scrap (or re-work) as described above.

Signed R. Jones

Ordered by J. Smith ☐ Foreman ☑ Inspector

Form No. 513 (SM) 7-46

Scrap or rework request order, prepared in duplicate by foreman or inspector, notifies production control of trouble. Special time tickets are prepared by production control for replacement operations

INSPECTION REPORT
WORK PROGRESS RECORD

Form No. 511

DATE	OPER. NO.	OPERATOR'S NUMBERS		REWORK TICKET NO.	SALVAGE TICKET NO.	SCRAP TICKET NO.	NO. PCS. STARTED	NO. PCS. SCRAP	NO. PCS. COMPLETED	INSPECTOR	SHIFT
9-4	10	260					22		22		D
9-4	10	44					78		78		N
9-4	10	44					100		100		N
9-4	15	44					100		100		N
9-4	15	44					24		24		N
9-5	15	260					76		76		D
9-5	20	260					100		100		D
9-9	20	10					100		100		D
9-10	30	10					100		100		D
9-10	35	10					100		100		D
9-11	40	55					100		100		D
9-13	42		124				100		99		D
9-14	43	55									D

Return This Card to Prod. Office When Parts Have Been Received in Stock Room

Work progress record card, bearing a reproduction of the route sheet on its reverse side, is placed in the cellophane envelope which accompanies each job lot through the shop. The inspector records on this card results of each check made on the various operations. It is returned to production control when completed parts are delivered to stock

covering such things as setup, machine repair, clean-up, waiting for inspection, waiting for a new job and waiting for material.

The operator, therefore, is not penalized in the wage-incentive system for delays not under his control. It is the supervisor's responsibility to see that each production worker, whose time is being charged on such tickets, checks back onto a production operation as soon as possible.

Another form is used when parts must be scrapped or reworked. Where parts must be replaced, the foreman or inspector notifies the dispatcher, who sends to the production-control office a report indicating what operations are necessary to replace the parts in question.

Production control then issues a special work order for the required operations, up to and including the last operation performed on the scrapped parts. Work on parts not scrapped is not permitted until scrapped parts have all been replaced.

Rectifiers Supply Power for Adjustable Speed Motors

METALLIC RECTIFIERS are practical for converting alternating to direct current for operating constant or adjustable-speed motors on machine tools. This conclusion has been reached following several years of laboratory tests coupled with 18 months actual operating experience in the Buffalo plant, Westinghouse Electric Corporation.

For the range of sizes from 1 to 15 hp., the cost is less than that for a motor-generator set; efficiency is higher; regulation is essentially the same; commutation is not adversely affected; mounting is not as much of a problem; and maintenance is simplified.

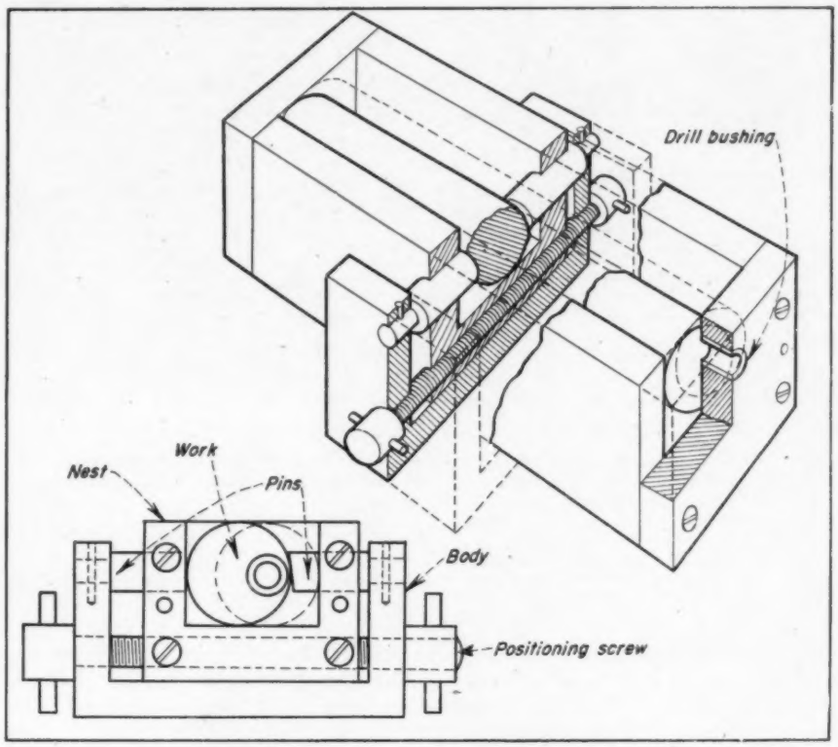
The power pack itself uses a selenium cell rectifier to convert the available ac. power supply into direct current. In many cases, control is reduced to the bare essentials; a standard ac. linestarter and a field rheostat.

When using the rectifier, the conventional dc. control can be supplied; but a simplification is possible by taking advantage of the natural internal resistance of the rectified. It is possible on the 1 to 7½ hp. sizes, to dispense entirely with the dc. control, and retain only the field rheostat. A simple safety switch or magnetic breaker can be installed in the ac. line for starting and stopping the motor, because it is possible to line-start the motor through the rectifier even when the shunt field rheostat is set to give a speed of four times the base or full field speed. Where dynamic breaking or reversing is required, a similar simplification of control is possible. This consists of omitting the fluttering relay on the shut field, omitting the starting resistance and all the relays and contactors associated with the starting resistance.

The efficiency of the rectifier pack alone is 80% for the self-cooled and 72% for the fan-cooled.

The initial cost of the rectifier power pack is not yet firmly established. However, just as the price of a motor-generator set varies approximately as the square root of the kilowatt rating, it varies almost directly on the rectifier. From this it is evident that on small sizes the rectifier drive will have a price advantage that it will lose on the larger ratings. Up to about 15 hp. the rectifier power pack is competitive with the motor-generator set.

Practical Ideas



Adjustable Jig Locates Double Centers

Shafts requiring a double set of lathe centers, one for concentric and one for eccentric turning, have been drilled in a single setting using this jig. An example of this kind of work would be a camshaft or crankshaft.

The jig has two prinicpal members. Work fits snugly into a box, which locates the part longitudinally and vertically. Drill bushings are carefully placed in each end of the box. The other part is the body or frame which forms a stirrup under the nest. The body carries two permanently mounted pins which pass through the walls of the nest and bear alternately against the sides of the piece. A positioning screw, floating in the body but threaded through the bottom of the nest, controls the position of the two main locating pins, and therefore, the lateral position of the part in the nest.

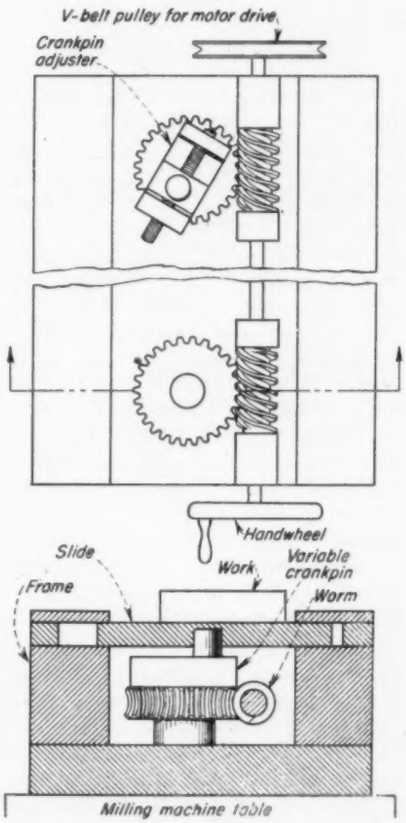
With the nest roughly centered over the body, both pins project slightly, but not enough to interfere in any way with the insertion or removal of work. Once inserted, the positioning screw is turned until resistance is met, signifying that one of the pins has pushed the part against one wall of the nest. Now, holes are drilled through the bushings in both ends.

The screw is then turned the other way until the opposite pin pushes the part to the other wall, and two more holes are drilled. The ends of the positioning pins are cut at an angle in order to exert a downward pressure and minimize any tendency to lift. The screw carries double handles for convenience. By making the nest end plates removable, bushings can be changed as required. It is most important, of course, to position the bushing somewhere along the diameter of the part, otherwise it would be impossible to locate a true center under any condition. *H. Moore, Leeds, England.*

Double-Crank Adjustable Miller Table Permits Circular Cuts

Rather than invest in an expensive machine, which we couldn't afford and which wasn't justified by present or projected production, we built this inexpensive fixture. It has saved us many dollars on all sorts of profiling and die sinking jobs.

The fixture frame is a long, heavy U or built-up channel. On top of the parallel-ground sides ride the

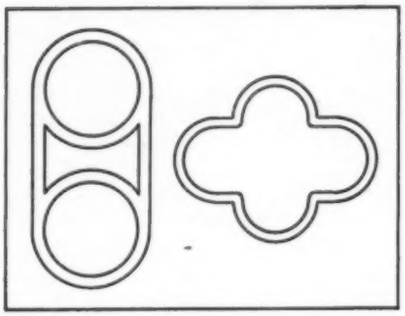


Parallel-rotary table motion fixes radius but offers unlimited choice of hole centers when the table is traversed

work plate, and guides on the edges hold the plate down but without restricting its movement anywhere in the horizontal plane.

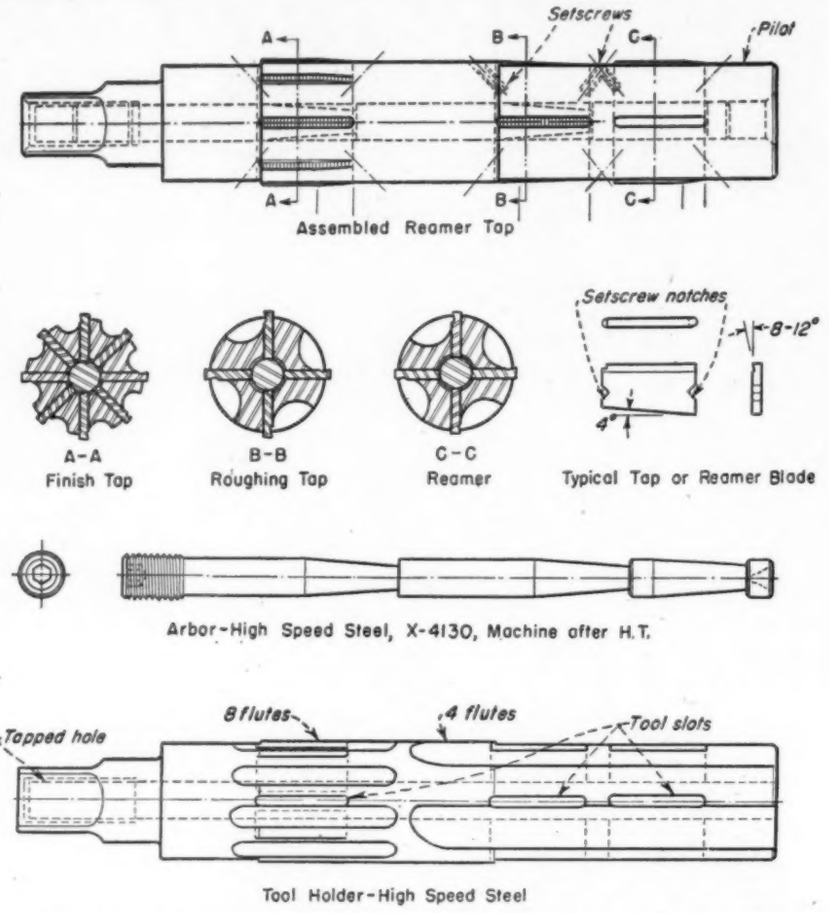
In the bottom of the U is a longitudinal shaft carrying two worms, and two wormwheels are mounted on vertical axes one near each end of the frame. At the end of each worm shaft is an adjustable-stroke crankpin which fits a corresponding hole in the bottom of the work plate. Then, when the worm shaft is turned by hand or power, the slowly-rotating wormwheels give the work plate a parallel rotary motion.

The fixture was specifically designed for milling two long parallel slots in a piece which had to be connected at each end with a semicircular groove of the same width. An ordinary rotary table would have required two setups for this job and adjustments would have been quite delicate in order to obtain a smoothly blended curve at each end. With this fixture, the straight, tangent portions are milled with the longitudinal table feed and the end curves are cut without stopping by giving the fixture work plate half a turn.



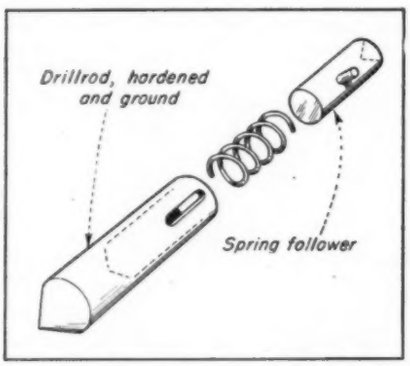
Grooves, composed of practically any combination of circular arcs and tangents are typical of work particularly suited to this fixture

With a standard rotary table, the work rotates about a single center, of course, and arcs or circles of any radius can be cut about one center by moving the machine table. With this fixture, the radius is fixed, regardless of table position, while the center can be moved to any desired point. Therefore, when a job comes along where a lot of holes or cavities or recesses of the same radius have to be cut in one piece, like a multiple-cavity die block, for example, this fixture permits milling them all without changing the setup, while by any other means, a new setup would be required for each hole. *Charles Schisler, Philadelphia, Pa.*



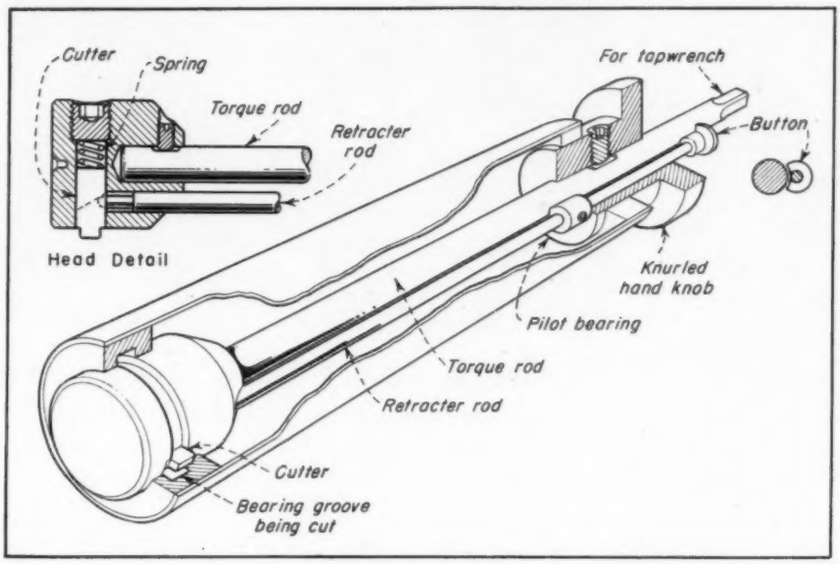
TRIPLE UNIT REAMER TAP FINISHES LARGE HOLES—Various blade combinations of reamers and taps are readily interchangeable in the body of this tool and adjustability is provided in such a way that every element can be accurately positioned. Blades are expanded with the three-step taper arbor which is controlled longitudinally by the thread at one end and turned by an Allen wrench, and locked in place with "toe-nail" setscrews bearing in notches on the blade ends. *Charles Kidwell, Wichita, Kansas*

Acme Thread Cutting is easier and faster when the work is first chased with an ordinary parting tool to full depth and width of thread. This will require several cuts as the bit should be narrower than the root width anyway. The sloping walls are then cut with a standard 29° tool. I have found that this method eliminates chatter and simplifies tool setting as well. *Howard De Heer, Grand Haven, Mich.*



Spring Wiggle Rod—Wiggle centering implies that the rod which fits between the tailstock center and the chucked piece must travel in a small gradually diminishing circle. The point rests in a small prick-punched depression in the work usually, while the other end has a female center to fit on the tailstock. Obviously, the tailstock must be adjusted until play is minimized but without undue tightness, or accuracy will be difficult to obtain. Also, as the piece is adjusted, the distance will change, and the tailstock will have to be adjusted also. This wiggle rod is more trouble to make, but because it is self-adjusting, it

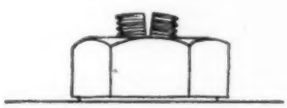
will stay in place at all times under practically uniform pressure and centering will be faster and more accurate as the wiggler can't jump out or chatter. *C. E. Hart, Newport Beach, California.*



DEEP RECESSES BURRED WITH HAND TOOL—Employing a sliding wedge for feed and a tapwrench for turning, this compact tool can burr or even cut grooves in deep holes. Pushing the thumb button retracts the cutter for easy insertion and removal. *Charles Kidwell, Wichita, Kansas*

Small Shop Shorts

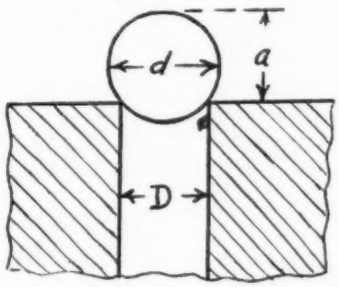
BY S. FRAMURZ,
Bombay, India



Splitting the Screw with a thin hacksaw cut before final assembly, then opening it slightly with a chisel after the nut has been tightened firmly will take the place of a lock washer in emergencies, or even in standard production. Spread apart in this manner, the screw will prevent the nut from slipping under any normal vibration in use, but the nut can be removed and replaced whenever desired.

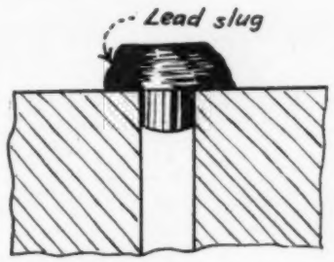
Hidden Nameplate Data is obtainable by a simple method when the mirror trick or others fail. Soft beeswax or paraffin is pressed against the invisible spot which must be read and the tablet obtained is carefully removed. A little chalk or any kind of white powder lightly brushed over the wax will bring out the information very clearly although a mirror may be required to reverse it for easier reading.

Thread Pitches can be determined easily by rubbing a little prussian blue over them, then carefully pressing a suitable strip of wood or cardboard against the blued portion to get an impression. This is extremely useful when the threads (either external or internal) are so located that usual gages are difficult or impossible to apply.

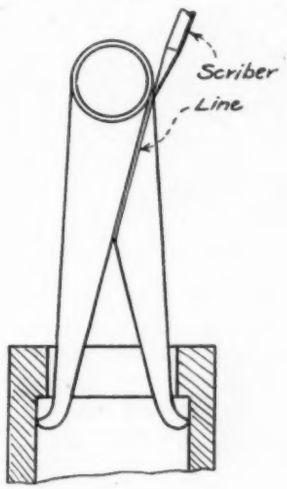


$$D = 2\sqrt{da - a^2}$$

Steel Balls are handy to have around. Small holes, into which calipers or gages cannot reach, can be measured very quickly, provided the hole in question is not bell-mouthed, by dropping in a ball of suitable diameter, and measuring the vertical projection with a height gage. This, plus the ball-diameter measurement, is all you need to calculate the hole diameter by applying the formula above.



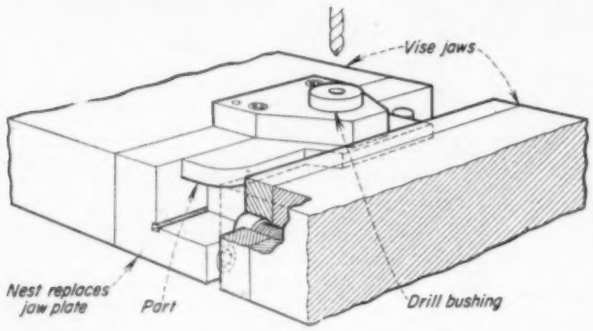
A Conical Slug of soft metal will often give satisfactory results directly. Just press or hammer the slug into the hole until a small pip is produced. This method also affords an opportunity to check the hole for straightness (lack of taper) and shows whether or not, and how much, the hole may be chamfered or bell-mouthed, thus giving accurate measurements impossible by the first (ball) method.



Transfer Calipers can be improvised simply by scribing a line or clamping a thin piece of flat stock on one leg of a firm-joint caliper when some obstruction prevents direct measurement. With the caliper in place and properly set, scribe the line indicating this setting, or clamp a thin piece of metal on one leg so it contacts the other leg. Then the caliper can be collapsed or opened and reset to the original position for measuring. The thin-metal strip method can only be used, of course, in the case of outside calipering.

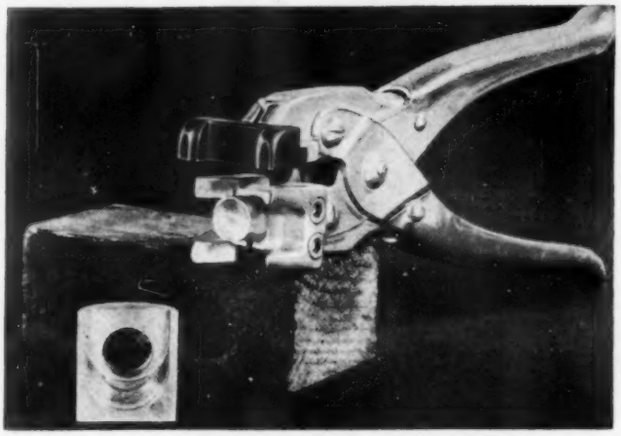
Old Toothbrushes tied back to back make efficient double-edged internal thread cleaners and chip removers. Handles can be bent and spacers inserted, where required, to vary the span of the brush.. *Henry S. Galus, New Bedford, Mass.*

Drill Jig Replaces Vise Jaw



Short runs prohibit expensive jigs, yet economy demands some device to maintain speed and accuracy. On many occasions, I merely substitute this flexible angle plate setup for one of the jaws of a standard machine vise. The part is located transversely against a stop pin at one end while the angle block and the remaining jaw hold it firmly. Drill bushing(s) are located in interchangeable drill plates screwed to the top surface of the angle block.

This method provides a maximum of interchangeability and adaptability for a minimum of cost, making it ideally suitable for short runs on diversified pieces of similar nature. *Arthur F. Hird, Lakeview, Ontario, Canada.*



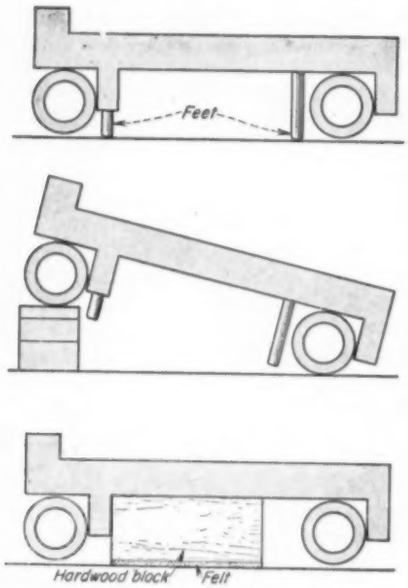
Carbide Jaws Release Wear

Production burring of many kinds has benefited by the adoption of special cemented-carbide plier or fixture-clamp jaws. Wire brushing and buffing involves highly abrasive materials and unless this precaution is taken, the holding device will be quickly worn away when in continuous service.

Here, mechanical refrigerator compressor-pistons require burring. Special-shaped carbide jaws have been added to a pair of parallel-jaw pliers to facilitate work holding and burring is done using a bristle and Adolox wheel. While ordinary pliers lasted only four hr., the carbide showed no appreciable wear after two months of continuous use. *C. W. Hinman, Gulfport, Miss.*

Sine Bar Feet Eliminate Wear

Sine bar rolls become flat in time due to constant wear along the line of contact after the instrument has been picked up and set down on the surface plate a good many times. Here's an idea which permanently overcomes any possibility of this occurrence without affecting the operation in any way, and yet without any adjusting or fiddling.



Three drillrod feet are permanently fastened into the bottom of the plate in such a way that, when resting on a plane surface, the feet support the sine plate with the rolls a few thousandths away from the surface. As soon as the plate is tilted even a trifle, however, the feet are in the air and the rolls are in contact with the surface plate and gage blocks.

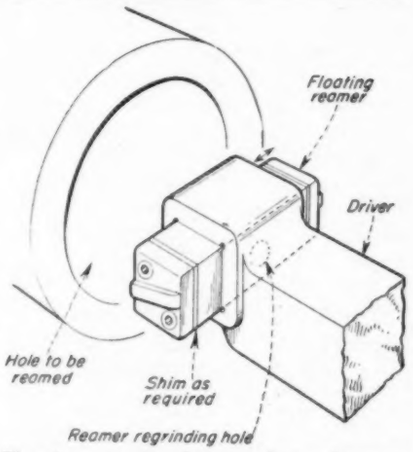
Alternatively, a rectangular block of wood could be screwed to the plate and the same result achieved. *Leonard T. Quick, Mimico, Ontario, Canada.*

Two-Flute Floating Reamer Centers In Large Bores

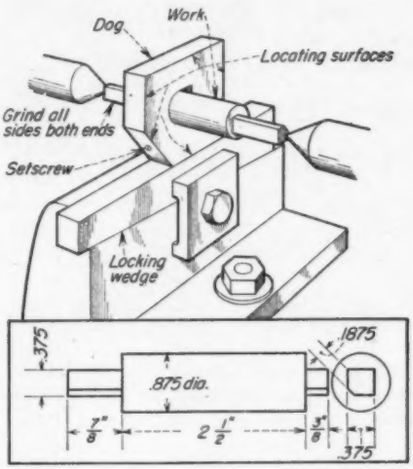
Bored holes from 1½ to 4 in. have been reamed, removing 0.002 to 0.005 in., successfully with the floating reamer shown. It could probably be used for work of larger sizes, but thus far it has not been necessary.

The cutting edges are placed at a 15° angle producing a shearing cut which leaves a smooth bore. The cutting heads have pilots which fit into the body of the reamer and are held in place by capscrews. A hole in the center of the body serves in sharpening. The body is mounted on an arbor and the heads ground to size. When they are undersized shims can be used under the heads.

The driver is a close sliding fit on the body of the reamer. It is possible to increase or decrease a hole as much as 0.001 in. by shim changes without appreciable loss of accuracy. Because the head is self-centering a shim change for such purposes need only be made on one end of the body. *Martin H. Ball, Watervliet, N. Y.*



Floating reamer has cutting edges at 15° angle to produce shearing cut

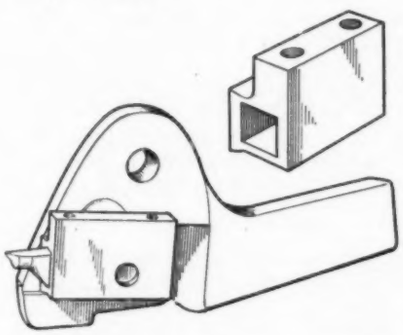


Indexing Dog—A difficult milling operation on both ends of a small shaft was performed with an "indexing dog" as illustrated. The ends had to be in perfect alignment and of the same size.

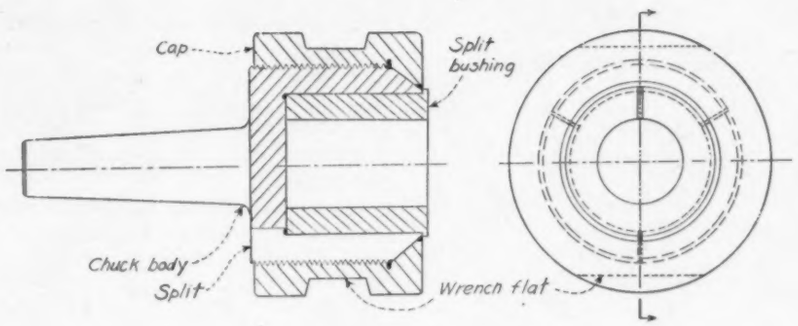
The indexing dog is a master or templet of the milled ends. The work is mounted between centers with the dog positioned in the center. A setscrew locks work and dog together and a locking wedge under the dog positions it.

Each end of the work is milled on one setting, then the locking wedge is removed and the work rotated to bring the next locating surface of the dog into position against the locking wedge. This process is continued until the shaft ends are completed. Accurate work has been produced for more than a year by this method.

Work of various shapes can be produced by changing the shape of the dog or templet. *M. J. Walsh, Pittsfield, Mass.*



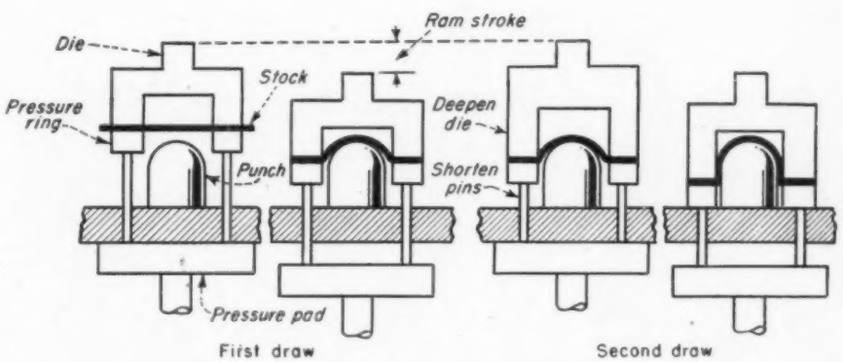
Adapter—Threading and forming toolbits requiring a spring toolholder have been adapted to use the standard Armstrong toolholder by the addition of the dovetailed, broached block shown. *Harold C. Savage, Los Angeles, Calif.*



Lathe, Miller Split Chuck Suitable On Short, Diversified Production

Bridging the gap between the standard engine lathe chuck and special expensive production chucks, this unit fits in well on many jobs. The chuck body and shank can be adapted to lathe spindle, or miller dividing head as desired, and the chucking arrangement does something that is a little beyond the scope of any standard type of collet chuck.

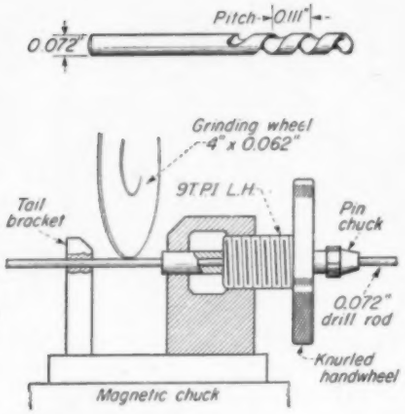
The chuck proper consists of a threaded cup which has been split in three places and given a 45° end chamfer for tightening with the threaded cap. Most work will be held by means of bushings, turned to fit the cup closely when open and bored to take the particular part in question. Bushings can be made up quickly from brass as each job comes along, and in time, quite an assortment will be accumulated. When one of these has served its purpose, it can usually be rebored slightly to suit another, slightly larger job. These bushings have a single split so the squeezing action will be transferred from the chuck to the work. *Arthur Silvester, Niantic, Conn.*



Short-Stroke Press Draws Cups

We had to make some stainless steel ladles drawn into a 3¼-in. diameter hemisphere using a press whose effective stroke was less than one inch. The solution was a double draw, the first drawing the blank to about ⅞-in. depth, and the second completing the job.

The setup for the second draw is the only one of particular interest. First, the pressure pins are shortened enough to prevent clamping the partially drawn shell until the ram has moved down slightly, centering the work perfectly. Second, the relieved die or draw ring is used instead of a shaped die, the punch being relied on to form the desired contour. These two factors have succeeded in producing perfect shells without wrinkling or tearing, and the plain draw ring allows easy removal without necessity for an ejector or knockout. *Bernard Berman, Brooklyn, N. Y.*



Screw Device Controls Helical Flute Grinds

Spring-winder mandrels had to be made from 0.072-in. music wire with a semi-circular flute of 0.111-in. pitch.

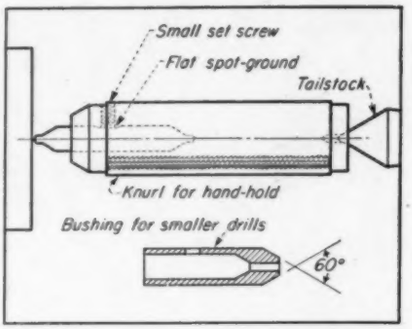
Initial attempts were unsuccessful; the answer proved to be a double-ended fixture having a chuck and a threaded bushing (of correct pitch) at one end and a slip-fit bushing at the other. The screw has nine threads per inch (giving the desired 0.111-in. pitch) and is left-handed. Diameter is anything convenient and the piece is equipped with a generous knurled handwheel for easy turning. Integral with the screw is a standard scriber chuck or pin vise. The assembled fixture is mounted on the magnetic surface-grinder chuck at the correct helix angle and a 0.062-in. rounded, 4-in. wheel does the grinding.

Distance between supports has to be short because of the thinness of the wire so the thread is produced a little at a time and rechucked frequently to get the long continuous helix.

The method is readily adaptable to the grinding of interrupted internal threads where usual feeding is impossible. *A. A. Sinisi, Jackson Heights, N. Y.*

Center Drill Holder Reduces Breakage and Allows Misalignment

Center drilling a piece of barstock can be a tedious operation. The center must first be carefully located and prickpunched, then, usually, a steadyrest has to be set up and adjusted to get the work centered with the tailstock. If this is not done with great care, the rigidly held, slender center drill is very likely to break off as it tries to follow a slightly eccentric punch mark. Sometimes it is not possible to locate the steadyrest near enough to the end of the piece for adequate support so this operation is always a tough one.



I have eliminated most of this trouble by fitting my center drills in a knurled holder. Now, the tailstock is gradually fed in with the right hand as usual while the drill is held on the tailstock and against the punch mark with the left hand. The flexibility of this method allows the drill to travel in a small cone with no danger of breakage, and the tendency to widen the hole is of very small consequence. Smaller center drills can be fitted in the same holder using a bushing, or separate holders can be constructed for each drill with very little trouble. *Ervin E. Wragg, Amherst, Ohio.*

NOW... $25 for the best Practical Idea in each issue

(in addition to regular payment for all exclusive contributions published)

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

Payment—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

Judges—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, will hereafter select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. The decision of the readers will be final in each case.

Requirements—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

Who May Enter—Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

How to Enter—Send your entry to "Practical Ideas Editor." American Machinist, 330 West 42nd St., New York 18, N. Y.

Forty-first Selection—Burnett Menken's Multi-Washer Die

NEWS OF METALWORKING

Control Over Distribution of Goods Rather than Prices Expected in '48

WASHINGTON — Inflation control from Washington, the special session of Congress makes clear, adds up to a lot of talk and little action. Manufacturers who are trying to estimate the course of prices next year can't count on anything the government does to pull prices down.

Before Congress even got to act on it, President Truman's inflation-control program was falling apart. The trouble is it was just a group of ideas thrown together on a Sunday night before Congress convened. The President's own cabinet never got together behind it, and cabinet members have been talking at cross-purposes in telling Congress what the program calls for.

Milder Proposals Likely

Of course Congress will go along with some of President Truman's proposals. Not price control or rationing, probably not bank credit limitations. But some of the milder ones. Most of the measures approved will be aimed more at control over distribution of goods than primarily at controlling prices.

These will be voted: Consumer credit controls (regulation W), but this will cover only installment buying, not charge accounts. Existing export and transportation controls will be extended past their March expiration.

These have a chance to get by: authority to fix margins on commodity trading; allocation of industrial commodities.

Allocation of Specific Goods

If allocation is approved, it will be limited to specific goods; grain and steel are the important ones. On steel allocation, administration planners have no thought of a war-type allocation system that would route every ton of steel, that would require every steel user to get an allocation. Simply, definite quantities of steel would be routed to export needs and to certain key domestic programs such as manufacture of freight cars and farm machinery. A few more—cans for goods like beer and coffee that could easily go to glass, for instance—would be forbidden. Otherwise steel would move in normal fashion.

Few government sources think that such a limited program would have much effect on prices.

However, here and there, there is a government economist who looks for a price break in 1948. The more optimistic think prices are near peak now; that business investment in new plants is likely to slack off at the turn of the year and take some of the pressure off prices. Others look for a rapid rise followed by a sharp break in the second half of the year.

Apprentices Set Record

WASHINGTON — An all-time record of 183,000 registered apprentices in skilled trades was reached this month, the U. S. Apprentice - Training Service reports.

More than 113,000 employers are participating in the programs, 52,000 of them in the non-construction fields.

Morris Sayre NAM President

NEW YORK—Morris Sayre, president of the Corn Products Refining Co., New York, was elected president of the National Association of Manufacturers by the Board of Directors. He succeeds Earl Bunting who will become chairman of the board Jan. 1.

Robert R. Wason was named chairman of the NAM executive committee. Others named to posts included:

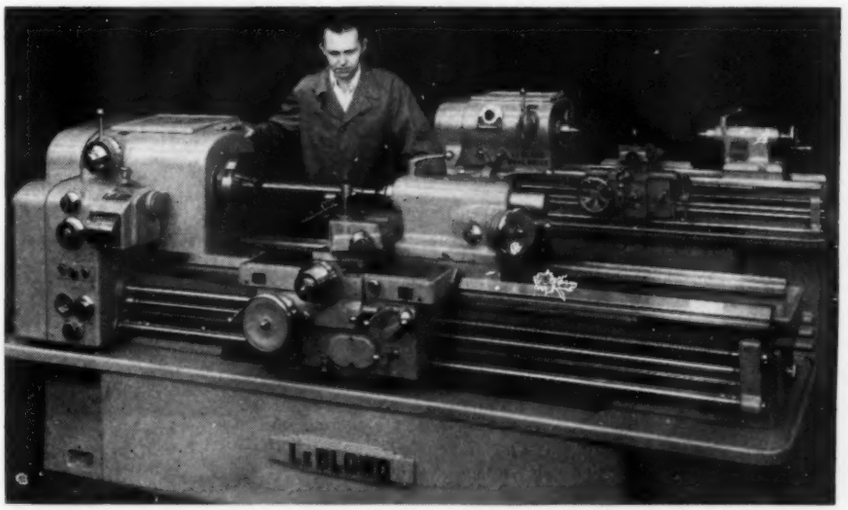
Ira Mosher, chairman of the finance committee; Thomas J. Bannan, Don G. Mitchell and Warren Whitney, national vice presidents; Noel Sargent was reelected secretary.

The election was a part of the program of the NAM's Congress of American Industry at the Waldorf-Astoria Hotel Dec. 3-5.

Featuring the Congress was the NAM's proposal for a national budget ceiling of $31 billion for the fiscal year of 1948-49. To achieve this, a reduction of departmental requests was proposed without skimping on needed national defense, foreign aid and veterans aid.

A $9.1-billion defense expenditure was seen possible, but "it is fully realized that, in the present unsettled world condition, events may reverse" a trend toward a peacetime Army and Navy and "much larger expenditures would be required.'

The lower budget, according to the NAM, would allow $10 billion or more for tax reduction and debt retirement.



What Happens To Show Machines? These two R. K. LeBlond Machine Tool Co. lathes were sold to International Harvester Co. The 16-inch Model RT tool room lathe in foreground is shown being checked for lead screw accuracy before shipment. The new Dual Drive is shown in the background. It has a selection of 12 spindle speeds ranging from 28 to 1800 rpm.

Railroads Seek Fourth Freight Rise Since Jan.

WASHINGTON—The railroads have come in for their fourth freight rate boost since the first of the year.

Although the latest increase (3%) asked is not as high as expected, it still brings the total requested boost in rates over the present level to better than 30%. Specifically, the roads now want a 41% increase in the Eastern district and 31% increase in the rest of the country. With the various commodity rate exceptions the average for the entire country is boosted from 27% to about 30%.

This amendment, the third since July, would return an estimated additional $164.7 million in rail revenues each year. This is to cover the 15½-cent-an-hour wage increase granted recently to the 200,000 members of the "operation brotherhoods."

Rates on coal, coke and iron ore, which are covered by specific cents-per-ton increases under the previous petitions before the Interstate Commerce Commission, would be increased another five cents a ton under the latest amendment to the petitions.

The scoreboard looks something like this. On Jan. 1 the roads were granted a rate increase of about 17% over previous rates. On July 3 the roads asked the ICC for another 17% boost. On Sept. 5 they asked that the July petition be amended to read 27%. The latest amendment brings the total to over 30%.

The ICC on Oct. 7 permitted the railroads to raise their rates by an average of 8.9% on a temporary basis. When the final rate adjustment is made sometime next year, it will replace this interim increase.

Tankers, Cargo Vessels, Liners urged by Group

WASHINGTON—High-speed tankers and cargo ships and a $500-million passenger-carrying fleet is needed, a group of experts recommended to President Truman recently.

But, whether we get more than a semblance of such a fleet depends as much on the availability of steel and other essential materials as on how much money Congress is willing to spend.

Need for a strong merchant marine was highlighted in the recent report of President Truman's five-man advisory committee on the merchant marine. The report stated that for fiscal 1948 the country should build five 180-passenger round-the-world ships and three 675-passenger ships for the New York-Mediterranean run.

Drum Carrier, which is attached to any fork-type power truck, handles from one to four drums at a time. Soft rubber shoes grip each drum firmly and gently. The drum carrier may be removed from the truck in 10 minutes, which is made possible by the Hansen quick-detachable hydraulic valve. Pallet Engineering Co. of San Francisco claims the unit gives the operator full vision

Engineers Elect E. G. Bailey Head

ATLANTIC CITY, N. J.—E. G. Bailey, Babcock & Wilcox Co. vice president, was formally elected president of the American Society of Mechanical Engineers at their convention here Dec. 1-5.

Four regional vice presidents selected were:

Frank M. Gunby, associate of Charles T. Main, Inc., Boston—Region 1.

Paul B. Eaton, head of mechanical engineering department, Lafayette College, Easton, Pa.—Region 3.

Thomas E. Purcell, general superintendent, Duquesne Light Co., Pittsburgh—Region 5.

J. Calvin Brown, president of the firm of J. Calvin Brown—Region 7.

Directors-at-large are:

J. B. Armitage, engineering vice president, Kearney & Trecker Corp., Milwaukee, to serve three years.

A. L. Penniman, general operations superintendent, Consolidated Gas, Electric Light & Power Co., Baltimore, four years.

William M. Sheehan, vice president, General Steel Castings Corp., Eddystone, Pa. four years.

Employers Blocked

WASHINGTON — Employers cannot obtain NLRB elections to determine the majority status of a union if the union's officials have not filed non-communist affidavits under the Taft-Hartley Law.

NLRB has denied a petition by Remington-Rand, Inc., seeking such elections to determine the status of the CIO Electrical Workers at seven plants in northern New York and Michigan.

Steel, Iron Shortages In India Bring Lottery

CALCUTTA, INDIA — India's tremendous shortage of iron and steel has provoked an unusual system of distribution in West Bengal province.

Faced with more than 40,000 applications for the meager 2,515 long tons allocated the province for the first quarter of 1948, the provincial government tossed up its hands and announced that it will divide up the quota by lottery to avoid charges of favoritism in distributing the scarce commodity.

Screw Machine Industry Notes Drop in Orders

CLEVELAND—Present backlogs for the screw machine products industry now stand at about eight weeks, with some of the larger manufacturers holding orders sufficient for 16 weeks of steady operation, Orrin Werntz, executive secretary of the National Screw Machine Products Association reports.

New orders for the 6-month period ending Oct. 31 were less than half those for the same period of 1946 to members making up the association's business index, Mr. Werntz said. February was high for the year (up to November) when invoiced sales for members of the NSMPA reached 148% and new orders attained 130% of February, 1946. Since then new orders declined steadily until October, but Mr. Werntz said that consideration must be given in the October, 1947, figure to an increase in price.

One of three things, possibly a combination of three, has happened to produce this sharp decline in volume and sales of screw machine products according to Mr. Werntz:

1. Customers making their own parts in captive shops.
2. Customers turning from former sources of supply to the remaining small wartime shops.
3. Customers either not having, or holding up orders, pending a closer look at 1948.

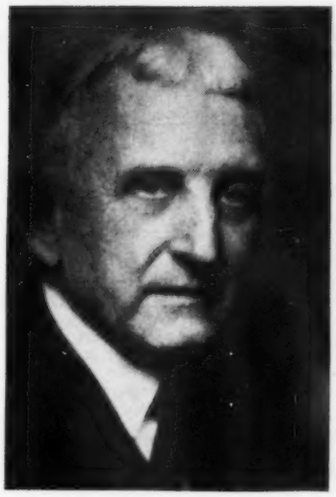
Test Labor Law On Affidavits

WASHINGTON—Consolidated Vultee Corp. is the subject of a significant test of the Taft-Hartley Labor Law being pressed by Philip Murray, president of the CIO Steelworkers, before the National Labor Relations Board.

The issue, which is expected to go into the courts, involves NLRB's refusal to certify USW-CIO as bargaining agent for nearly 2,000 employees in the plant at Nashville, Tenn., which was converted from aircraft to stove production. The union has not complied with the non-communist affidavit requirements of the new law.

The Steelworkers defeated the International Assn. of Machinists (Ind.) in a bargaining election on Aug. 21, the day before the Taft-Hartley Law became effective, but the corporation has not bargained with the CIO union because of an existing contract with the IAM.

As a result, the Steel Workers went on strike Nov. 8, but members of the IAM continued to work.



Frederick S. Chase

Frederick S. Chase, retired president of the Chase Brass & Copper Co. and member of the board of the Kennecott Copper Co., died at the age of 85 at the Waterbury (Conn.) hospital Dec. 5. With his father and brother, Mr. Chase developed the Chase company from a small concern to one of the largest brass and copper companies.

Foreman Decision Asked

WASHINGTON — Edward G. Budd Mfg. Co., Detroit, has asked the Supreme Court to reverse a two-year-old NLRB decision requiring reinstatement and back pay of a discharged foreman.

The company relies on Taft-Hartley policy.

German Factory Will Be Set Up On Pacific Coast

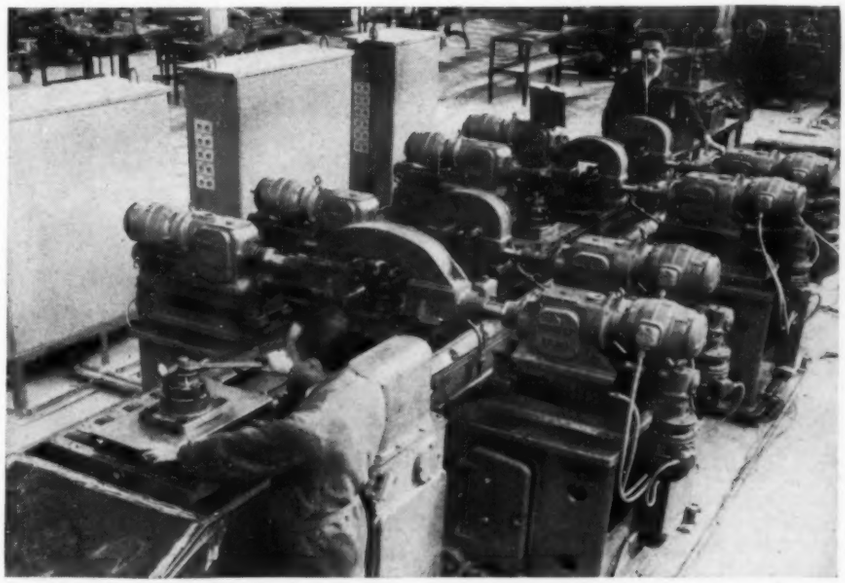
OAKLAND, CALIF. — Henry J. Kaiser's Permanente Metals Corp. has announced it was successful bidder for the first German reparations plant offered to United States industry, an aluminum foil plant at Teningen Baden. The plant is expected to be in operation in Washington state by next summer to become the only foil plant west of the Mississippi.

Permanente's bid of $203,000 was accepted by the Foreign Liquidation Commissioner. The cost of moving the plant, together with import duties, will bring its total cost to approximately $1,200,000. The 52-mill plant, formerly the Aluminumwerke Tscheulin, is considered one of the most efficient and diversified operations of its kind in the world.

Foil for use in electronic, radio, refrigeration and air conditioning equipment will be made at the plant along with foil for wrapping purposes. The new mill will use plate or sheet metal, but also could use ingots.

New Yugoslav Truck

MILAN — (McGraw-Hill World News)—According to reports received by the Italian automobile industry from Belgrade, the Sabac State Engineering concern has started output of a 3200-pound truck driven by a Diesel engine which is to use both ordinary crude oil and charcoal gas. The new type truck should be produced at the rate of 100 daily.



Transfer Machine, electronically controlled, takes a rough casting and passes it automatically along a work table where eight tools, in series of two, finish it completely at the Renault plant at Billancourt, near Paris

Gaging Business

Machine Tool Industry Rolling

The machine tool industry is looking up. The usual seasonal decline in sales at the year-end has not occurred, and inquiries are of record proportions. In fact, inquiries are so numerous that builders have been enlarging engineering staffs to handle proposals.

One of the most encouraging developments is the increased demand for standard machines. Engine lathes in the smaller sizes, such as 16 in., and radial drills are moving well. Radials are much more active than they were only a few months ago.

Planer Builders Busy

Planer builders are doing a very good busines. Orders for export have been much larger in proportion to the total than they have in the machine tool industry as a whole. The automotive industry has been placing orders for specialized machine tools for 1949 model production.

Foreign sales provide the big question mark for the industry the coming months. The consensus is, however, that a fairly satisfactory volume will come from countries and firms financed by the Export-Import Bank and by the International Bank and from nations, like Argentina and Switzerland, which have dollars to spend here.

Export Field Active

The truth is that export orders are being placed in reasonably healthy volume, and from unexpected sources. A Middle West builder, for example, just received a cabled release for eight heavy-duty lathes for which an import license had been granted by the Netherlands government. Another company got a phone call from Sweden for immediate shipment of three machines which had been held up.

Machine tool business has come recently from Czechoslovakia, Poland, Switzerland, Belgium and the Argentine. In Latin America, U.S. builders are running into competition with British and Italian machines.

Rise in Prices Feared

Many machine tool builders fear that they may be driven to further price advances by increased production cost. In certain instances, companies announced increases effective December 1, giving their customers 10 days in which to place orders at the old prices. In that way, bookings of those companies last month were abnormally high.

Metalworking Output High

Metalworking production shows no tendency to lag as the year end approaches. Limitations of materials and manpower continue to act as a brake here and there, but on the whole, the metalworking industries will go into 1948 with good order books, sizable inquiries and employment staying at an all-time peacetime peak.

Chief worry is whether the European aid program will cut down the amount of steel available for domestic fabrication. The third round of wage increases, and its effect upon production costs, is another vexing problem.

Opinion Varies On Steel

Opinion differs widely on how much sheet and strip steel will go to U.S. customers the next 12 months. Some steel people are confident that the automobile industry will get just as much tonnage as this year, and perhaps a little more, despite demands from Eurpoe. They base their opinion on the fact that new capacity will be coming in during 1948.

Automobile makers are not too confident, however. They are trying to protect themselves "just in case," as demonstrated by Studebaker's acquisition of Empire Steel and Ford's channeling of more funds into its own production of steel.

Allocations Anticipated

A surprisingly large segment of the steel indsutry believes that there will be some form of allocation to meet Europe's needs. The method to be used, should it come, is anybody's guess.

"AH AH — TEMPER!—TEMPER!"

As a result of scarcity of carbon steel, there has been an easing of the supply of stainless steel sheet and strip to the point where three to five weeks delivery can be obtained from the larger producers. For other high-alloy steels with special specifications, delivery runs eight to ten weeks.

Tool and Die Business Improves

Continued improvement is reported among contract tool and die shops. Orders received have been steadily rising since the low spot in August, each month showing a gain over the preceding one.

Output of these shops, based on billings, has been going up too. October was markedly better than September, and November is believed to have more than matched the October total. The volume thus far this year is running slightly ahead of last year.

Farm Equipment Demand Booms

Booming conditions are reported in the tractor and farm equipment industry. New plant facilities are being rushed to completion in the hope that operations can be stepped up soon. Foreign demand continues unabated. One producer has been compelled to hold exports to 10% to maintain the prewar ratio.

British program to mechanize farming in Africa is bringing considerable business to this country. One Wisconsin company has an order for 1500 sets of tractors, planters, plows, combines and other plantation machinery for delivery to Tanganyika, where it is hoped that production of vegetable oil seeds will amount to 600,000 tons a year by 1951.

Press Makers Doing Well

Producers of mechanical and hydraulic presses have sufficient business to keep operating at full capacity for some months ahead. The automotive industry has yielded a large volume of orders, partly in connection with expanded facilities as well as with new model changes.

Backlogs are being reduced month by month, but even so the incoming orders give promise that the entire year 1948 will be comparable with 1947 in output.

Drop Forge Sales Brisk

The drop forge industry is doing a better business dollar-wise this year than last. From a low for the year in July, production rose to the year's peak in October. It is doubtful whether the November level was as high as the previous month's.

Inquiries are brisk and the outlook is favorable for continued good business through the winter months.

Detroit

CAR OUTPUT IN HIGH GEAR...FIVE MILLION GOAL SEEN...
DETROIT PAYROLLS AT POSTWAR HIGH, CONTINUE TO GROW

Automobile production facilities approached the end of the year in high gear. Volume during late November and early December was racking up an impressive succession of volume periods with assemblies of cars and trucks ranging upwards of 100,000 a week to the neighborhood of 115,000.

This made it virtually certain that when all returns are in, more than 5 million vehicles will have been produced. The year 1947, accordingly, stacks up as one of the best in automotive history—in spite of the frequently heard complaints that the car makers haven't been turning out what they should have.

For next year, the prophecies run fairly uniform. First, they are all hedged against the possibility of important strikes or important allocations of steel for Marshall program requirements. Then, with these qualifiers inserted, output is anticipated from 10% to 15% in excess of the 1947 total—say about 15% on passenger cars, and unchanged totals on trucks.

Relief on Steel Doubted

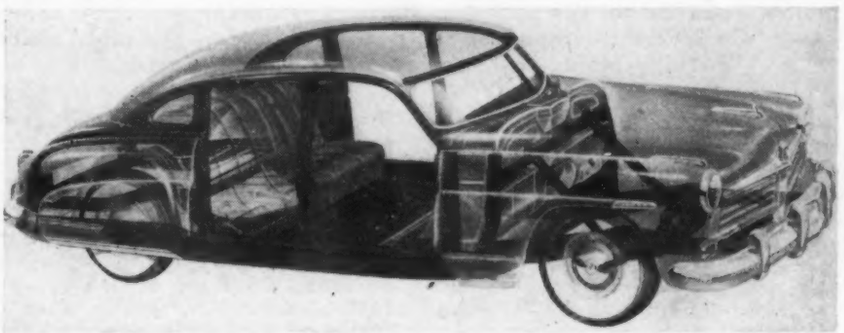
This would give the industry an approximation of its best year, 1929, when the total was 5,621,045. The way demand continues to hold up, that volume projection would be substantially enlarged. But auto companies now do not expect any real large-scale relief on steel sheets during 1948.

Indicative of this freely-voiced expectation was the move of Studebaker Corp. early in December to purchase the Empire Steel Co. mills at Mansfield. The Empire facilities are hardly new—the sheet mill is a hand mill operation—yet the South Bend company was willing to invest $7,430,000 to cover its steel requirements in the medium term ahead. Once the pressure is off, steel circles expect, Empire's cost sheets may run somewhat high.

The Studebaker purchase will likely divert some flat rolled stock to South Bend formerly coming to Detroit. Most of this was for gas tanks. The amount of sheet moved into the Detroit district was not significant. By the same token, however, South Bend's forward production anticipations can be considered brightened.

Ford May Expand Facilities

On the subject of steel, it should be noted that Ford is now reconsidering part of its recently announced $15-million program to expand its steel facilities at the Rouge. The new blast furnace is going in, for sure—dramatizing the needs or more pig. But there is some question whether the revisions to the open hearths will be carried out, inasmuch as digging down into details turned up the finding that costs would be considerably higher than were first estimated.



Monobilt Body and Frame of Hudson's new all-steel unit is shown in phantom view. The box-section frame is built into the body and extends outside the rear wheels, providing girder protection on all sides and is described by Hudson engineers as the "strongest, most rigid, twist-free body and frame ever built"

Michigan employment continues to enlarge slowly but steadily. Detroit's payrolls stand at a new postwar high for factories; definite scarcities are noted for tool and diemakers and other skilled craftsmen —sheet metal workers, electrical wiremen, machinists, millwrights, patternmakers, and the like.

The tool and die shops themselves are maintaining a steady pace at previous levels. Aside from a modest amount of Chrysler work which has been moving onto the benches, and the continued Ford placements, there has been little of real consequence.

Now Dubbed 1949 Model

Slowness in obtaining tool and die needs from out-of-city shops is credited in Detroit as the reason why Ford has gone through a succession of postponements of its new model introductory date—now shoved back to June, and dubbed a 1949 instead of a 1948. Some of this work fell far behind schedule, say trade sources. At the same time, they say the new line is well worth waiting for.

Checker Cab Mfg. Corp. at Kalamazoo, meanwhile, has completed, after lengthy difficulties, a retooling program which will result in a start on taxicab production schedules at the end of the year. A run of about 8,000 cabs is planned by this producer, which owns a majority interest in Parmalee Transportation of New York, and in other companies operating elsewhere—thereby giving it a fairly ready market.

Checker's new model is especially interesting in that it can be revamped into a salesman's vehicle or 7-passenger car. The company plans to finish up the immediately-in-demand production run, then start turning out the modified jobs.

That controversial figure in the farm implement field, Harry Ferguson, is back in the news again. His company has been casting about for facilities to build its tractor ever since the arrangement with Ford lapsed some time ago. On Dec. 1, however, Ferguson told a group of suppliers and distributors of the Ferguson tractor that, "we now know that arrangements will soon be completed" to produce the job.

The identity of the new manufacturer is a closely guarded secret. Gossip has linked the deal to a scattering of Detroit and southeastern Michigan concerns.

New Implements Developed

Ferguson has also developed a number of new implements. The most interesting of them is a trailer, hooked up to the tractor like standard implements, so the integrated unit functions over short hauls on highways or longer hauls through fields like a 3-ton truck.

Chevrolet is experiencing satisfactory results from its new system of assembly at Flint, which incorporates the hanging of the frame from a monorail, rather than towing it along a floor conveyor. Not only is the new method justifying itself from a production standpoint, but it also appears to be resulting in bettered employee relations. The assembly is completely accessible to the workers: they need not reach across it nor under it, and their fatigue is accordingly reduced. They like it. Also, the new type of line makes for better housekeeping—it can be swept clean underneath nightly.

West Coast Plane Plants Need Aid

Government must consider aircraft concerns in national security plans rather than as private industry, Harry S. Wharen, Associate Editor, American Machinist, reports after a five-week tour of Coast. Metalworking plants now competitors of Eastern producers

CALIFORNIA—West of the Pecos is still the Golden West. No longer can it be considered an industrial upstart trying to compete with the East. It is competing—now.

War-time expansion, post-war migration, increasing availability of home-made steel, expanding markets—all are bringing the Far West's industrial age to a degree of maturity.

But like the rest of the country, the Far West, despite its fantastic growth in population, high factory wages and industrial expansion, has problems neither easily solved nor readily understood by those who have a voice or a vote in the matter.

Gloomiest is the condition of those plants, big and little, that made up the once-vast Southern California aircraft industry. During the war, many believed that the aircraft industry would stabilize at a peace-time production of 5 to 10% of its peak war-time rate.

Companies Losing Money

But to stabilize at this rate and yet maintain a healthy productive and financial position are two different things—entirely different when we consider "a healthy productive position" one that can form the basis for hurry-up expansion that may be needed in this period of international bickering.

Optimistic forecasters point out that aircraft manufacturers have larger military and civilian backlogs than before the war. But what do these backlogs mean when the same companies are losing money constantly?

These backlogs do not warrant retaining organizations that, in total, can be considered a stable defense industry. Major aircraft companies no longer have the skilled workers that must form the backbone of an important defensive weapon. Tool designers and toolmakers, around which any production program revolves, have been lost, and are still being lost, to other industries.

Military contracts and civilian demand have both failed to give us an industry geared to the defense needs of our country. And the mounting cost of manufacturing and the increased complexity of modern airplanes, under adverse financial conditions, will mean less development and research work unless we begin thinking of aircraft manufacturing in terms of national security, rather than as just another private industry.

14-Time Increase On Tooling

It has been estimated by one company that to engineer and tool for the first hundred airplanes of an intended new model will cost 14 times as much as for the first hundred of a comparative-sized pre-war plane. No longer are development costs figured in the hundred thousands of dollars; they are figured in millions. Without an industry in healthy financial condition, from adequate military or civilian work, we shall fall behind.

You may ask, "Why do not aircraft companies diversify their products?" Some have — to their regret and confusion. For Ryan, metal caskets was a carry-over item that helped, but it was never over 10% of its business and has now been sold out.

Northrop tried several ventures—was successful on its aeronautical institute and may make out on its Turbodyne work with Joshua Hendy. But they pulled out of Salsbury Motors and the Northrop Foundry.

Douglas, enthusiastic on its aluminum boat project, has now shelved it but may revive it.

Diversification has not been the answer — at the most a make-shift device. The only answer can be a national policy to maintain a minimum industry that meets mobilization planning requirements — and the money and contracts to implement that policy.

Other metalworking companies seemingly fall into two classes: those that tied their kites to the aircraft industry and had no standard peace-time product and those that stayed out of aircraft work or had a product to which they could reconvert.

Auto Program Rolling

The first group, especially tool and die shops, has had high fatalities. Many have engaged in wild hunts to pin down "elusive" salable products. Scarcity of good products and inadequate experience in a competitive market have not helped. Not knowing how to bid competitively and the added burden of high wages have been reflected in rejections of bids by automotive manufacturers trying to farm out work on the Coast.

But the automotive program is beginning to roll. Ford Motor Co.'s $60 million-a-year California parts-buying program has progressed to the point where contracts have been signed with 88 California manufacturers. Small screws, screw machine parts, forgings, wiring assemblies, coil springs, wheels and other parts are being produced locally. All passenger-car wheels used in West Coast Ford plants are now being produced by California factories from steel produced on the West Coast.

Companies established before the war have had far less trouble and are now riding the crest of a near boom. But up and down the Coast, their cry is the same: scarcity of really skilled workers.

One company pointed out that so-called toolmakers were plentiful, but

Rocket and Jet-Powered Skyrocket, built by Douglas for the Navy, was designed to obtain aerodynamic data near the speed of sound (761 mph. at sea level). Sequel to the world-speed record holder, the Navy-Douglas Skystreak, this new plane is the first of its type with both rocket and jet power plants, making it capable of landing and taking off under its own power

not good ones; that too many had "learned their trade" by building aircraft fixtures and Class Bodies, but could not hold down a bench in a first-class die shop. Its comment on unskilled help — plentiful.

Industrial construction is booming, estimated at one-fifth of all U. S. industrial building. New plants are springing up, some from expansion of native companies and others as branches of eastern companies or as new homes for organizations moving west.

Eastern companies establishing coast branches are approaching the problem in two ways: putting up brand new plants or buying out going businesses. Westinghouse has taken the second track by leasing the Joshua Hendy plant at Sunnyvale. Advantages — a ready-made working force and a management with a western viewpoint.

The question many companies are asking is, "Can we compete with the East with our higher factory wages and high freight rates?" One company is doing it successfully by shipping by water. Another has made a detailed study showing it can compete with the Middle Atlantic States as far east as Denver and Kansas City, depending on carload or lcl. shipments.

The general opinion is a positive "yes" for the eleven Western States, western Central and South American countries, and, of course, Hawaii and the Orient.

One other point should not be overlooked. Factory construction costs can be held lower. One company, the A. O. Smith Electrical Mfg. Co., enthusiastic and optimistic over weather conditions, has even established a vessel plant out of doors, complete with gas-cutting machine, rollers, welding and X-ray machines, crane, concrete floor but no walls or roof.

Boatyards in San Diego area report a rate of activity above normal with a favorable outlook well into the coming year. Repairs and conversions for fishing vessels rather than new ships account for the bulk of the work in progress.

The principal source of new business is the conversion of some 15 Navy YP patrol boats which are being sold to tuna-fishing interests by the government at a fixed price of $125,000 each for adaptation to tuna clippers at a cost almost equal to the purchase price.

Converting the boats are the Martinolich Ship Building Co., National Iron Works, Lynch Shipbuilding Co. and San Diego Marine Construction Co. Martinolich also has converted a 102-ft. Y&S for Dutch use; National Iron has launched a new $300,000 steel tuna clipper and is half through construction of a floating laboratory for the University of Southern California, the Velero IV; and San Diego Marine is planning construction of a tug boat for the Star & Crescent Co. Each yard has also a number of smaller contracts.

Air Policy Unit Seeks 3200 New Planes Annually

WASHINGTON—In a statement considered by many to be at least "uncautious" the U.S. Air Force has asked the President's Air Policy Commission for 131 air groups to utilize 12,441 military airplanes.

Air Force Secy. Stuart Symington, testifying in person, told the Commission that an annual procurement rate of 3200 planes, with airframe weight of 46,414,000 pounds, would be necessary to maintain the regular force of 70 groups. The balance of the 131 groups would be organized air reserve and national guard units.

Navy Figures Additional

These figures do not include the Navy air arm. Total procurement for USAF and Navy this year will be only 1700 planes, which falls far short of enough to give the armed forces protective striking power and to keep alive the aircraft industry as an expansable nucleus.

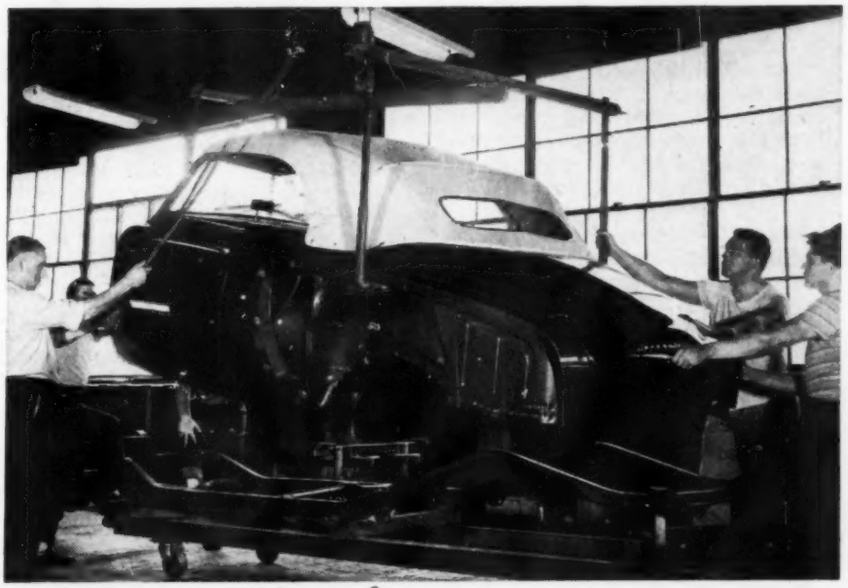
Fifteen major companies showed an aggregate loss of $85 million in 1946 before tax carryback. This condition was brought about by virtual cessation of military orders, use of surplus equipment by the airlines, and failure of lightplanes to find a mass market.

The Policy Commission and the Brewster Air Policy Committee in Congress will jointly recommend a new U.S. military-civil air program, with emphasis on airpower, for legislative action this coming session.

6,869 for Firstline

Of the 12,441 planes requested, 6,869 would be firstline combat units for the regulars and 8100 for the reserve, some of which would be transferred from the regular forces. There are 2,507 Boeing B-29s in storage.

Gen. Carl Spaatz, USAF chief-of-staff, recently said the Russians have 14,000 first line military planes, but he did not elaborate the all-important matter of their quality. Almost certainly the policy board's recommendations will push the U.S. aviation industry into greater activity.



Special Dollie used by Studebaker in the production of 1948 convertible models has a regular frame welded to it. The body is bolted to this frame at the start of production and continues on the same dollie throughout subsequent operations. Rigidity is one advantage of this method since the body is held in the same position it will occupy on the chassis of the finished car

Allis-Chalmers Observes 100 Years of Production

MILWAUKEE—Allis-Chalmers Mfg. Co., builder of the world's largest line of major industrial products, is observing its 100th year of operations.

Employing more than 30,000 in nine plants, the concern now produces equipment for power generation, distribution and utilization among its 1600 diversified products.

Output of Chicago Metalworking Concerns Surpassing 1946 Marks

CHICAGO—The year-end is finding Chicago metalworking plants turning out a far greater volume of goods than they were at the start of 1947. But there are several trouble spots on the horizon, and output would be considerably higher than it is today if these problems could be cleared up.

One difficulty that continues is shortages of materials. Sheet steel and plates continue tight. In the next few months, also, farm equipment makers may be suffering from a pig iron shortage. At present pig iron is selling for less than the price of scrap steel and as a result commercial foundries are switching to pig instead of scrap. The result is that the farm machinery firms are running into a tight pig market, and if the supply does not improve production of farm machines will be hampered next Spring.

Labor Very Short

Labor continues very short. One metalworking executive says the situation is critical and much worse than last year. Electro-Motive Division, General Motors, says that the firm's immediate problem is to add "several hundred" skilled metalworkers to its force. Electro-Motive's output is up 50% over last year but could be much higher if enough men were available. The company's backlog will require a year to complete.

Oliver Corp., makers of farm equipment, says that output is up 10 to 15% over 1946, but the firm can use 400 to 500 more men at the Charles City, Iowa, plant. Oliver, like several other firms, is finding the housing shortage blocking efforts to get more help. Men who are willing to move to Charles City, for example, can find no living quarters. Oliver's South Bend, Ind., plant can also use 200 more workers.

General American Transportation Corp. reports that output is up 50% over last year, in freight car production, and other lines have also shown increases. The company, which needs 500 more men, says that its backlog has increased 100% in the last year.

Harvester reports that demand is booming but that materials and manpower shortages are hampering production. Harvester is pushing ahead rapidly with its expansion plans, however. In recent months three major construction projects were begun, and next year Harvester plans to spend $30 million retooling the firm's motor truck plants.

Farm equipment makers in the Chicago area report that foreign demand for their products is unlimited, and expect exports to increase considerably as the result of Congressional grants for foreign reconstruction. Alva W. Phelps of Oliver Corp. says export demand is "unlimited" but that the comapny is maintaining its prewar ratio by holding exports to 10% of production.

Farm Machines For Africa

A new aspect to the farm equipment export picture is developing as the result of British efforts to develop mechanized farming in Africa. The British thus far have been willing to spend cash for machines to develop their African colonies, and have been buying bulldozers, farm tractors and planters.

One British project, in Tanganyika, a "peanut project," is aimed at producing 600,000 tons of vegetable oil seeds by 1951, and the British are scouring the market for machines for this African area.

Massey-Harris Co., Racine, Wis., already has an order for 1,500 sets of tractors, planters, plows, combines and other machinery for the project. The order may be substantially raised.

Indicative of the labor shortage throughout Illinois is the fact that the number of jobless applying for unemployment compensation is the lowest since the end of the war. Throughout the state a weekly average of 48,000 jobless applicants are now seeking compensation payments; in October, 1945, following the end of the war, the number averaged 168,000.

W. M. Goss CBRA Head

NEW YORK—William M. Goss, vice president of the Scovill Manufacturing Co., Waterbury, Conn., has been elected president of the Copper and Brass Research Association.

Vice presidents chosen by the association include: H. W. Steinkraus, Bridgeport Brass Co.; S. H. Perry, Chase Brass & Copper Co., Inc., Waterbury, Conn.; G. D. Stearns, Bridgeport Rolling Mills Co.; and A. C. Wheeler, Seymour Manufacturing Co.

F. L. Riggin, Mueller Brass Co., Port Huron, Mich., was named treasurer.

Reel Broaching takes 0.015-20 of an inch off each of the five spiders of the reel of an all-steel, lightweight mower. This operation produces exact measurements necessary for assembling of the mower

Workers Ignore Grievance Clause

CHICAGO—Although the Taft-Hartley law gives individual workers the right to submit grievances to management as individuals, most workers in Chicago metalworking plants continue to act through their unions. They are skipping the new law's benefits.

Few workers are attempting to bypass unions in taking up complaints. And most management men who were questioned prefer it that way, since time is saved.

The Employers Association of Chicago is aware of only one case, involving three workers of a newly-certified union, in which individual grievances were submitted to employers.

Priorities Seen Reducing Supply To Steel Users

PITTSBURGH — October and November were good months in steel production and December started out auspiciously, but long-term delivery prospects are uncertain.

It appears rather definite to an important segment of both the producing and consuming trade that priority tonnage is destined to be larger, which can only mean that distribution of steel in other channels must be smaller.

This takes into consideration requirements for "essential" domestic users and the European Recovery Plan.

On the other hand, there are no signs that any type of steel consumer will be classed as "non-essential."

How the argument in respect to steel allocations will be resolved in Washington is a question. It may be determined by expediency or by some compromise.

4.5 Million Tons More Seen

The 2.5-million-ton ingot expansion program of the steel industry has become one of 4.5 million tons. This gradually will become evident in statements to be made by various steel executives. The program has been so revised that these leaders expect 2.5 million tons will be obtained from construction and 2 million tons from enlargements and better utilization of existing facilities.

The steel companies do not wish to establish this program on any higher basis because of the need of channeling steel to build new facilities.

While there is no mention of any factor such as a probable accelerated amortization plan, the possibility that such a proposal may develop in Washington is not to be ruled out.

The steel trade claims that new ingot facilities would cost $300 per ton of annual capacity. They cannot afford this, they claim, on the basis of present steel prices. About 4.5 million tons would go in with depreciated plant account and the average cost would not be raised unduly.

Situation Unchanged

The scarcity situation in most steel products reflects little change as the year draws near a close. In some items, there are minor fluctuations in delivery conditions. Cold-finished bars have been tightening up recently after a period of easiness, while one branch of the pipe family — small-size seamless tubing — is more plentiful.

The tightest situations are in sheets and strip, plates, nails and other wire products, large diameter pipe and a few specialties.

Alloy steel materials are more or less easy to obtain. Consumers are utilizing substitutions where a product is tight. Thus, more expensive floor plates are being used in tank work. Some consumers are buying strip coils and cutting up their own sheets.

The production outlook depends upon the availability of scrap during the next three months, the period when this metal normally is the most difficult to obtain. Conditions in the scrap market have been quiet, but the lull may be illusory. The industry is striving to establish geographical price differentials such as existed under OPA.

Airborne Tanks Seen In Future

WASHINGTON—Tanks light enough to be flown from one front to another will play a decisive role in the event of another war, according to a military expert.

Maj.-Gen. James M. Gavin, who commanded the parachute assault troops in the Normandy invasion, said, "The heavy tank of World War II is so outdated it belongs in the Smithsonian Institute."

"Armor in the future must fly, just as all other means of war must fly," said the general in a copyrighted article in the Armored Cavalry Journal. "Either we show foresight now and develop the means that will enable us to fly everything we need for combat or another nation will," was his cryptic remark.

Gen. Gavin envisioned airborne armor of the future as being made of plastic, silicate, magnesium and soybeans to reduce its weight.

Another thing the general wants is a plane that can fly many different types of payloads, up to 10 tons, that can hedge hop with such a load for 1,000 miles, and can land in a pasture.

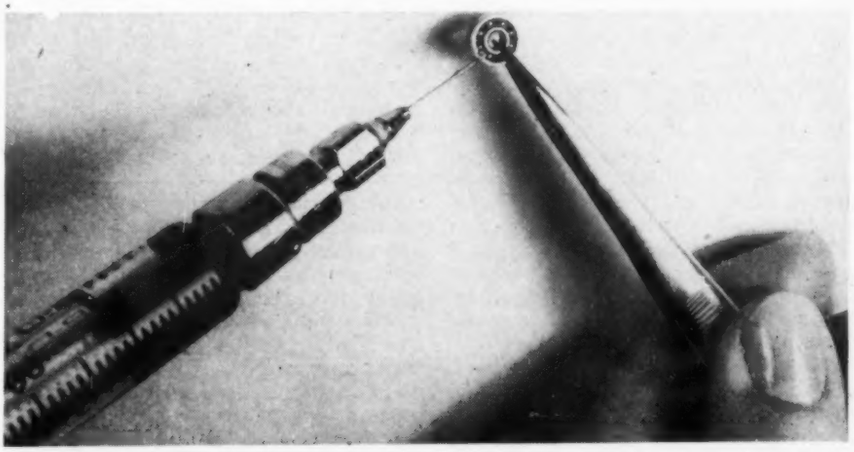
Cost of Living, Profits Cited in CIO Wage Plans

WASHINGTON—CIO's decision to seek a third round of postwar wage increases stems from the conviction that there is a present inequity in the wage-price-profits relationship which President Truman's anti-inflation program would not correct even if Congress were to put it into effect.

According to the resolution of CIO vice presidents, workers in manufacturing industries have suffered a loss of more than 18% in weekly purchasing power since January, 1945, despite the unprecedented wage increases obtained in the first and second rounds. At the same time, the CIO asserts that 1947 profits will be above the $17 billion after taxes, and that substantial wage increases can be paid out of profits without further price increases.

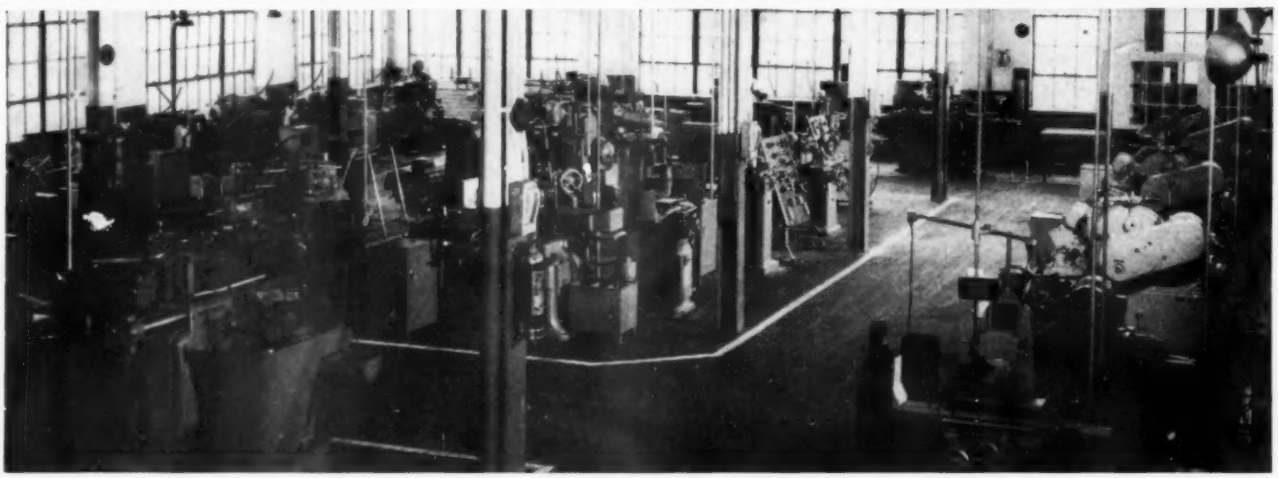
Purpose of the resolution was to give the green light to individual unions to strike out for higher wages when their contracts permit. President Truman's program and other legislation will be considered by the CIO policymakers in January.

In a recent press conference, CIO President Philip Murray stated that the amount of wage increase would vary by industries, depending on the needs of the workers and the ability to absorb the increases.



Smallest Fully-Ground non-magnetic ball bearing in the world is produced by New Hampshire Ball Bearings, Inc., for electrical, electronic, geophysical and similar applications requiring freedom from magnetic influences as well as for general use. Beryllium copper is used and the bearing has standard dimensions of ¼ inch outside diameter, 5/64 inch bore and a 3/32 inch width

Brown & Sharpe Exhibit Draws Thousands



PROVIDENCE, R. I.—Several thousand, including employees of Brown & Sharpe Mfg. Co., their families and friends, saw the company's exhibit from the Machine Tool Show in Chicago, which was reerected in the company's plant here. The equipment—26 machines in all—was shown in operation and there were attendants to answer questions.

Many employees saw for the first time the finished product for which they make components. Frequently workmen pointed out to their families various machines and their operation. There were cases in which persons spent a half hour watching a particular machine perform.

As a result of the show, many employees' wives and children learned the type of work by which their husbands and fathers earn a livelihood. Accuracy and pride of workmanship now mean more to those who attended in a family group.

In addition to the present employees, many retired workers and former employees of Brown & Sharpe attended. These "oldtimers" especially noticed the strides in design and machine development since they were actively engaged in the business.

Of particular interest in the machinery display was the new automatic pinion turning machine, producing staffs at the rate of one every five seconds. The automatic screw machines with wide range of speed ratios and the automatic screw threading machine, making a complete screw every second, drew much attention.

It was obvious on the day of the employees' show that every visitor enjoyed the display and since then company officials have had many requests to repeat the show for the benefit of those unable to attend the initial showing.

Lincoln Welding Award Presented

BALTIMORE, MD. — Arthur C. Thompson, general superintendent in the shops division of Koppers Co., Inc., won the fourth Containers Classificational Award of $1300 in the James F. Lincoln Arc Welding Foundation Design-for-Progress Award program.

The Subject of the prize-winning paper was the redesign of a 20 million cu.ft. gas holder to replace riveted construction with welded construction. Through reduction in weight, freight, shop and field labor, tool costs and engineering total overall costs were lowered 15%. At the same time strength was increased as well as durability and resistance to corrosion. Maintenance problems will be minimized.

Names in the News

Calvert Carey

Fred Dunning

Calvert Carey, formerly vice president in charge of manufacturing, has been elected president of The Yale & Towne Manufacturing Co., succeeding the late **W. Gibson Carey, Jr. Fred Dunning,** secretary and treasurer of the firm, has also been elected executive vice president. Both men have served as members of the board of directors for several years.

George S. Dively, vice president and general manager since 1944 of the Harris-Seybold Co., has been elected president and general manager succeeding the late **Alfred S. Harris.**

George S. Dively

Emmet F. Harding has been appointed general sales manager of Corbin Screw Div., The American Hardware Corp., New Britain, Conn. He succeeds **Elliot C. Paddock,** who resigned Dec. 1.

Henry D. Sharpe, president and treasurer of the Brown & Sharpe Mfg. Co., Providence, R. I., has relinquished his post of treasurer. He was succeeded in that position by **Frederick P. Austin, Jr.,** who was also elected a vice president.

Ralph Andrews has been elected president of the Morse Manufacturing Co., Inc., Syracuse, N. Y. He succeeds **J. Mott Morse,** founder of the firm, who has retired.

Clifford B. Mueller, Jr., has been named general sales manager of The Schaible Co., Cincinnati, succeeding **Sidney A. Mullikin.**

Joseph A. White, formerly general superintendent of the Columbia Steel Co., Pittsburg, Calif., has been named works manager of the Chicago plant of Ingersoll Steel Div., Borg-Warner Corp., while **Milo F. McCammon,** formerly assistant works manager at the plant, has been named works manager at Kalamazoo.

Joseph M. Brennan has been named general manager of the drop forge division and **George F. Bluth** as director of manufacturing facilities and methods of Willys-Overland Motors, Toledo, Ohio.

Arnold M. Lenz has been made assistant to general manager **H. L. Klingler** in charge of all manufacturing at Pontiac Motors.

Ralph H. Lundberg has been elected a vice president of Peninsular Grinding Wheel Co., Detroit.

W. C. Newberg has been named president of the Airtemp Div., Chrysler Corp., succeeding **D. A. Russell,** who has retired.

Harold H. Budds, former vice president of the Fairchild Engine & Airplane Corp., has been named executive consultant to the president and coordinator of engineering and production of the Tucker Corp., **M. W. Dulian** was appointed sales manager at the same time.

W. G. Ritzenthaler and **L. R. Niep** have been elected president and treasurer, and vice president, respectively, of the Great Lakes Supply Corp.

Lyman W. Slack, director, vice president and general sales manager of The Packard Motor Car Co., Detroit, has resigned. He has been replaced as general sales manager by **Karl M. Greiner.**

Lee H. Benson has joined Tuthill Pump Co., Chicago, as vice president in charge of manufacturing. Mr. Benson has had over 40 years' mass-production experience with various firms including General Motors, Willys-Overland and Westinghouse.

W. E. Day has been named director of research for Mack Trucks, Inc., New York. He relinquished his former positions as chief metallurgist and general foundry superintendent.

Kenneth J. Flood has been named factory manager of the Kaiser-Frazer Detroit engine division.

Bernard F. Anderson has been appointed general manager of the Elmira, N. Y., plant of Remington Rand, Inc.

Nicholas C. Clausen has been elected president of the Clausen Iron Co., Inc., Albany, N. Y. He succeeds his late father, **Holger S. Clausen.**

Robert L. Regan, who has been associated with Boeing Aircraft Co. since 1928, has been named factory general superintendent in Seattle.

Jerry M. Gruitch has been appointed director of research and development for American Car & Foundry Co., New York.

Alton A. Way has been appointed manager of the River Road plant of the Chevrolet Motor Div., General Motors Co., Buffalo.

M. D. Eisele is the new head of the Chicago district sales office of Permanente Products Co. He replaces **C. S. French,** who is serving as district sales manager in Cleveland.

John A. Deitrich has been named manager of the Alloy Tube Div., The Carpenter Steel Co., Union, N. J.

George H. Lynn has been named Western Division sales manager of Niles Tool Works, with headquarters in Chicago.

BUSINESS ITEMS

Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn., has acquired the manufacturing rights for the products of the **Magnetic Gage Co.,** Akron, Ohio. Operations will continue at Akron until early next year when production will be transferred to West Hartford.

McGill Carbide Tool Co. has been formed by **Charles C. McGill** at 4612 Woodward Ave., Detroit. The firm will supply tungsten carbide tipped tools for standard and special applications.

Portable Electric Tools, Inc. has moved its office and factory to 255 West 79 St., Chicago.

Aircraft Screw Products Co., Long Island City, N. Y., will change its name to **Heli-Coil Corp.** on Jan. 1.

Apex Smelting Co., Chicago, has purchased the plant, laboratories and equipment of the **National Smelting Co.,** Cleveland, and will begin operation on Jan. 2 as the Cleveland plant of Apex.

Ward Leonard Electric Co. has established a New England office at 37 Webster St., Hartford, Conn. **C. F. Shea** is district manager.

Yoder Die Casting, Inc., has opened its new plant at 727 Kiser St., Dayton, Ohio.

M. A. Ford Mfg. Co., Inc., Davenport, Iowa, has appointed the **Walter E. Winfrey Co.,** Cambridge, Mass. as its representative in eastern Massachusetts, Rhode Island, New Hampshire and Maine.

The Arseneau-Price Co., Detroit, is now manufacturing a complete line of standard straight shank chucking reamers, straight and spiral flute from ⅛" to ½" dia.

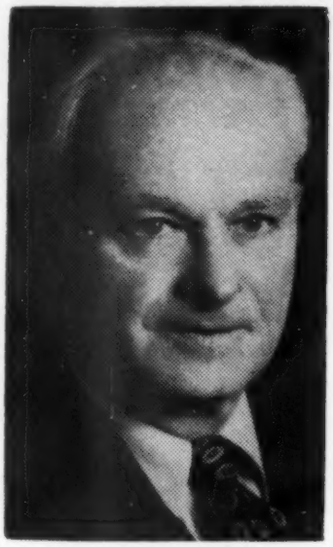
Visual Planning Equipment Co., Pittsburgh, has been organized by **Homer H. Dasey** and his staff for the design, promotion and sale of three-dimensional planning equipment.

Odom and Nyhan, a consulting engineering firm, has been formed in Chicago as a partnership between **W. E. Odom** and **J. E. Nyhan.**

Thermoid Co., Trenton, N. J., has opened its Nephi, Utah, plant with full production scheduled by February.

Century Steel Co., Hollywood, Calif., has been organized by **Lewis** B. Kean, Lewis B. Kean, Jr., and **Mason A. Miles.** A mill will be erected in Los Angeles county.

OBITUARIES



Bradford Foote, Sr.

Bradford Foote, Sr., 75, president and treasurer of the Brad Foote Gear Works, Chicago, which he founded in 1924, died Nov. 19. Before forming his own company, he was associated with his brothers in the Foote Bros. Gear and Machine Co. He was one of the deans of the gearing industry and spent his life in the manufacture of gears and gearing products.

Oscar M. Polk

Oscar M. Polk, 70, Dayton industrialist, died suddenly Nov. 22. Mr. Polk joined the City Machine and Tool Works in 1912 and continued as head of the firm, which was later reorganized as the Sheffield Corp. His son, Louis, became president and active head of the firm in 1932, while Mr. Polk remained as chairman of the board until his death.

Thomas DeLaney, 77, former executive sales manager of the Lisk Manufacturing Co., Canandaigua, N. Y., died recently.

Alfred J. Marchev, 51, president of the Aircraft Screw Products Co., Inc., Long Island City, N. Y. passed away Nov. 28. He had been president of the Republic Aviation Corp. during the war and retired last May as chairman of the Republic board to become president of Aircraft Screw Products Co. A prominent inventor, he had more than 500 patents to his credit.

Thomas W. Warner, 73, retired auto parts manufacturer, died Dec. 2 after a two-week illness. Founder of The Warner Gear Co., Muncie, Ind., which became a principal unit of Borg-Warner Corp., and the Warner Manufacturing Co., Toledo, Ohio, which merged with General Motors, Mr. Warner has been in virtual retirement since 1921.

Harold B. Gaylord, 67, Philadelphia sales manager for The Carpenter Steel Co., passed away Nov. 26. He had been associated with Carpenter in Philadelphia for over 30 years.

Donald R. MacAllister, president of the Syracuse Heat Treating Co., Syracuse, N. Y., died recently.

Robert B. Lewis, 73, chief engineer of the Tinius Olsen Testing Machine Co., Philadelphia, for 35 years, passed away Oct. 24.

Howard F. Parkerton, Sr., 62, manager of the Farrel-Birmingham Co., Inc., sales office at Los Angeles, died Oct. 27.

Joseph L. Young, president and owner of the Young Machine & Tool Works, Buffalo, died suddenly. He formed the company in 1916 and was active until his death.

George F. Nye, 83, president of the Dobbie Foundry & Machine Co., Niagara Falls, N. Y., died recently.

William Keller, 63, who retired last year after 19 years as president of the National Bronze Foundry, Buffalo, died recently.

MEETINGS

Materials Handling Exposition. Public Auditorium, Cleveland, Jan. 12-16. Clapp & Poliak, 350 Fifth Ave., New York.

Pressed Metal Institute. Annual meeting. Hotel Statler, Buffalo. Feb. 10-11. Sam Morrison, vice president, Morrison Steel Products, Inc., Buffalo, chairman.

Society of Automotive Engineers. Annual meeting. Book-Cadillac Hotel, Detroit. Jan. 12-16. John A. C. Warner, secretary and general manager 29 West 39 St., New York.

You Can TELL It's a Threadwell

— by its COLD-TEMPER performance — treated at 120° below zero to give it the hardness that means more threads per tap

—by its *i-dot-ification—red* dot for cut thread, *white* dot for commercial ground, *blue* dot for precision ground

— by its *polished flutes* for extra protection against chip clogging and breakage

— by its greaseless rust-proofing that keeps it clean, dry and shining—never messy and sticky

— by its *tap-capsule* that provides individual tap protection and makes it easy to select the right tap before unwrapping

— by the *personal attention* service your tap orders, large or small, get at the factory and at your local Threadwell distributor's.

See for yourself what these Threadwell extras mean to you in terms of better, easier, lower cost thread production. Just ask for Threadwell — they cost no more.

Delivery on standard items now being made from stock

SOLD EXCLUSIVELY BY MILL SUPPLY DISTRIBUTORS THROUGHOUT THE UNITED STATES AND THE WORLD

Threadwell
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY - GREENFIELD, MASSACHUSETTS, U. S. A.

CALIFORNIA OFFICE, THREADWELL TAP & DIE CO. OF CALIF., 1322 SANTA FE AVE., LOS ANGELES 21

SAW WITH

Starrett

HACKSAWS and BAND SAWS

for

MORE CUTS PER DAY

MORE CUTS PER SAW

PRECISION MADE BY THE WORLD'S GREATEST MAKERS OF PRECISION TOOLS

Buy Through Your Distributor

STARRETT

TO GET THE MOST OUT OF HACKSAWS AND BAND SAWS

Starrett Hacksaw Booklet "C" describes the complete line of Starrett Hacksaw Blades for hand frame and hacksaw machine and Starrett Band Saws for cutting metal, wood and other materials. Starrett Cutting Chart instantly gives complete information for cutting any material by hacksaw or band saw. Write for copies.

THE L. S. STARRETT CO. · ATHOL, MASSACHUSETTS · U. S. A.

World's Greatest Toolmakers

STARRETT

PRECISION TOOLS • DIAL INDICATORS • STEEL TAPES • GROUND FLAT STOCK

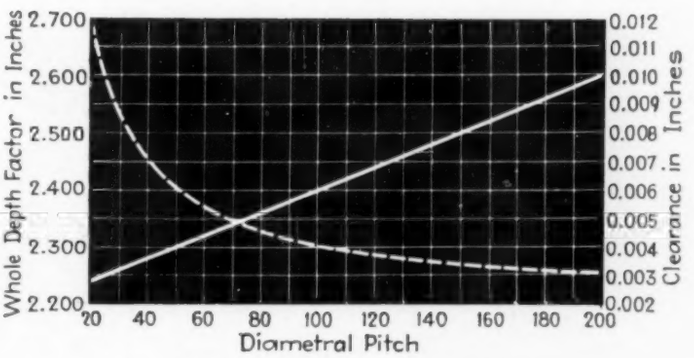
HACKSAWS • BAND SAWS FOR CUTTING METAL, WOOD, PLASTICS

Clearances for Fine-Pitch Gears—I

American Gear Manufacturers Standard 470.01
This standard establishes clearances for all 20° pressure-angle, fine-pitch gears of 20 D.P. and finer, except bevel gears. Greater clearances than for coarse-pitch gears are required to allow for:

1. Greater wear on point of generating tool.
2. Fillet radius produced by dull generating tool is greater than derived from formula $0.157/D.P.$
3. Accumulation of foreign matter at bottom of teeth.

Proportions are: working depth $=2.000$ in./P; whole depth $=$ 2.2000 in./P + 0.002 in.; clearance $=$ 0.200 in./P + 0.002 in.; whole depth factor $=$ 2.200 in. + (0.002 in. $\times$ P). Maximum recommended tolerance for cutter addendum is plus 0.2 $\times$ clearance, minus nothing. The chart gives whole depth factors and clearances for 20 to 200 D.P.



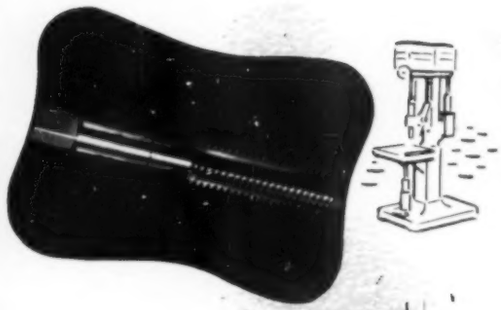
To compare pitches on basis of 1 D.P., use Whole Depth Factor Curve (solid line). Clearances are shown by dash-line curve

STANDARD TOOTH PARTS FOR 20-DEG. PRESSURE ANGLE FINE-PITCH GEARS

TABULATED VALUES ARE IN INCHES

Diametral Pitch	Circular Pitch	Standard Circular Thickness	Working Depth	Whole Depth	Clearance	Standard Addendum	Standard Dedendum
20	0.15708	0.07854	0.1000	0.1120	0.0120	0.0500	0.0620
21	0.14960	0.07480	0.0952	0.1068	0.0116	0.0476	0.0591
22	0.14280	0.07140	0.0909	0.1020	0.0111	0.0455	0.0565
23	0.13659	0.06830	0.0870	0.0977	0.0107	0.0435	0.0542
24	0.13090	0.06545	0.0833	0.0937	0.0104	0.0417	0.0520
25	0.12566	0.06283	0.0800	0.0900	0.0100	0.0400	0.0500
26	0.12083	0.06042	0.0769	0.0866	0.0097	0.0385	0.0482
27	0.11636	0.05818	0.0741	0.0835	0.0094	0.0370	0.0464
28	0.11220	0.05610	0.0714	0.0806	0.0092	0.0357	0.0449
29	0.10833	0.05417	0.0690	0.0779	0.0089	0.0345	0.0434
30	0.10472	0.05236	0.0667	0.0753	0.0087	0.0333	0.0420
31	0.10134	0.05067	0.0645	0.0730	0.0085	0.0323	0.0407
32	0.09818	0.04909	0.0625	0.0708	0.0083	0.0313	0.0395
33	0.09520	0.04760	0.0606	0.0687	0.0081	0.0303	0.0384
34	0.09240	0.04620	0.0588	0.0667	0.0079	0.0294	0.0373
35	0.08976	0.04488	0.0571	0.0649	0.0077	0.0286	0.0363
36	0.08727	0.04363	0.0556	0.0631	0.0076	0.0278	0.0353
37	0.08491	0.04245	0.0541	0.0615	0.0074	0.0270	0.0344
38	0.08267	0.04134	0.0526	0.0599	0.0073	0.0263	0.0336
39	0.08055	0.04028	0.0513	0.0584	0.0071	0.0256	0.0328
40	0.07854	0.03927	0.0500	0.0570	0.0070	0.0250	0.0320
41	0.07662	0.03831	0.0488	0.0557	0.0069	0.0244	0.0313
42	0.07480	0.03740	0.0476	0.0544	0.0068	0.0238	0.0306
43	0.07306	0.03653	0.0465	0.0532	0.0067	0.0233	0.0299
44	0.07140	0.03570	0.0455	0.0520	0.0065	0.0227	0.0293
45	0.06981	0.03491	0.0444	0.0509	0.0064	0.0222	0.0287
46	0.06830	0.03415	0.0435	0.0498	0.0063	0.0217	0.0281
47	0.06684	0.03342	0.0426	0.0488	0.0063	0.0213	0.0275
48	0.06545	0.03272	0.0417	0.0478	0.0062	0.0208	0.0270
49	0.06411	0.03206	0.0408	0.0469	0.0061	0.0204	0.0265
50	0.06283	0.03142	0.0400	0.0460	0.0060	0.0200	0.0260
51	0.06160	0.03080	0.0392	0.0451	0.0059	0.0196	0.0255
52	0.06042	0.03021	0.0385	0.0443	0.0058	0.0192	0.0251
53	0.05928	0.02964	0.0377	0.0435	0.0058	0.0189	0.0246
54	0.05818	0.02909	0.0370	0.0427	0.0057	0.0185	0.0242
55	0.05712	0.02856	0.0364	0.0420	0.0056	0.0182	0.0238
56	0.05610	0.02805	0.0357	0.0413	0.0056	0.0179	0.0234
57	0.05512	0.02756	0.0351	0.0406	0.0055	0.0175	0.0231
58	0.05417	0.02708	0.0345	0.0399	0.0054	0.0172	0.0227
59	0.05325	0.02662	0.0339	0.0393	0.0054	0.0169	0.0223
60	0.05236	0.02618	0.0333	0.0387	0.0053	0.0167	0.0220
61	0.05150	0.02575	0.0328	0.0381	0.0053	0.0164	0.0217
62	0.05067	0.02534	0.0323	0.0375	0.0052	0.0161	0.0214
63	0.04987	0.02493	0.0317	0.0369	0.0052	0.0159	0.0210
64	0.04909	0.02454	0.0312	0.0364	0.0051	0.0156	0.0208
65	0.04833	0.02417	0.0308	0.0358	0.0051	0.0154	0.0205
66	0.04760	0.02380	0.0303	0.0353	0.0050	0.0152	0.0202
67	0.04689	0.02344	0.0299	0.0348	0.0050	0.0149	0.0199
68	0.04620	0.02310	0.0294	0.0344	0.0049	0.0147	0.0196
69	0.04553	0.02277	0.0290	0.0339	0.0049	0.0145	0.0194
70	0.04488	0.02244	0.0286	0.0334	0.0049	0.0143	0.0191
71	0.04425	0.02212	0.0282	0.0330	0.0048	0.0141	0.0189
72	0.04363	0.02182	0.0278	0.0326	0.0048	0.0139	0.0187
73	0.04304	0.02152	0.0274	0.0321	0.0047	0.0137	0.0184
74	0.04245	0.02123	0.0270	0.0317	0.0047	0.0135	0.0182
75	0.04189	0.02094	0.0267	0.0313	0.0047	0.0133	0.0180
76	0.04134	0.02067	0.0263	0.0309	0.0046	0.0132	0.0178
77	0.04080	0.02040	0.0260	0.0306	0.0046	0.0130	0.0176
78	0.04028	0.02014	0.0256	0.0302	0.0046	0.0128	0.0174
79	0.03977	0.01988	0.0253	0.0298	0.0045	0.0127	0.0172
80	0.03927	0.01964	0.0250	0.0295	0.0045	0.0125	0.0170
81	0.03879	0.01939	0.0247	0.0292	0.0045	0.0123	0.0168
82	0.03831	0.01916	0.0244	0.0288	0.0044	0.0122	0.0166
83	0.03785	0.01893	0.0241	0.0285	0.0044	0.0120	0.0165
84	0.03740	0.01870	0.0238	0.0282	0.0044	0.0119	0.0163
85	0.03696	0.01848	0.0235	0.0279	0.0044	0.0118	0.0161
86	0.03653	0.01827	0.0233	0.0276	0.0043	0.0116	0.0160
87	0.03611	0.01806	0.0230	0.0273	0.0043	0.0115	0.0158
88	0.03570	0.01785	0.0227	0.0270	0.0043	0.0114	0.0156
89	0.03530	0.01765	0.0225	0.0267	0.0042	0.0112	0.0155

CUTTING COSTS IN MANY PLANTS IN THE METAL WORKING INDUSTRY



★ A great many parts similar to these illustrations are being surface broached more economically than was possible with previous machining methods. Fine finish to close tolerances is maintained and production up to 2000 pieces per hour is obtained on many of them. Send blueprints and production requirements for an analysis of your machining problem. We will be glad to give you the benefit of our long experience in the development of surface broaching.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

FOOTBURT *Surface Broaching*

FOOTBURT PATENTED TOOTH FORM

Clearances for Fine-Pitch Gears—II

STANDARD TOOTH PARTS FOR 20-DEG. PRESSURE ANGLE FINE-PITCH GEARS *(continued)*

TABULATED VALUES ARE IN INCHES

Diametral Pitch	Circular Pitch	Standard Circular Thickness	Working Depth	Whole Depth	Clearance	Standard Addendum	Standard Dedendum
90	0.03491	0.01745	0.0222	0.0264	0.0042	0.0111	0.0153
91	0.03452	0.01726	0.0220	0.0262	0.0042	0.0110	0.0152
92	0.03415	0.01707	0.0217	0.0259	0.0042	0.0109	0.0150
93	0.03378	0.01689	0.0215	0.0257	0.0042	0.0108	0.0149
94	0.03342	0.01671	0.0213	0.0254	0.0041	0.0106	0.0148
95	0.03307	0.01653	0.0211	0.0252	0.0041	0.0105	0.0146
96	0.03272	0.01636	0.0208	0.0249	0.0041	0.0104	0.0145
97	0.03239	0.01619	0.0206	0.0247	0.0041	0.0103	0.0144
98	0.03206	0.01603	0.0204	0.0244	0.0040	0.0102	0.0142
99	0.03173	0.01587	0.0202	0.0242	0.0040	0.0101	0.0141
100	0.03142	0.01571	0.0200	0.0240	0.0040	0.0100	0.0140
101	0.03110	0.01555	0.0198	0.0238	0.0040	0.0099	0.0139
102	0.03080	0.01540	0.0196	0.0236	0.0040	0.0098	0.0138
103	0.03050	0.01525	0.0194	0.0234	0.0039	0.0097	0.0137
104	0.03021	0.01510	0.0192	0.0232	0.0039	0.0096	0.0135
105	0.02992	0.01496	0.0190	0.0230	0.0039	0.0095	0.0134
106	0.02964	0.01482	0.0189	0.0228	0.0039	0.0094	0.0133
107	0.02936	0.01468	0.0187	0.0226	0.0039	0.0093	0.0132
108	0.02909	0.01454	0.0185	0.0224	0.0039	0.0093	0.0131
109	0.02882	0.01441	0.0183	0.0222	0.0038	0.0092	0.0130
110	0.02856	0.01428	0.0182	0.0220	0.0038	0.0091	0.0129
111	0.02830	0.01415	0.0180	0.0218	0.0038	0.0090	0.0128
112	0.02805	0.01402	0.0179	0.0216	0.0038	0.0089	0.0127
113	0.02780	0.01390	0.0177	0.0215	0.0038	0.0088	0.0126
114	0.02756	0.01378	0.0175	0.0213	0.0038	0.0088	0.0125
115	0.02732	0.01366	0.0174	0.0211	0.0037	0.0087	0.0124
116	0.02708	0.01354	0.0172	0.0210	0.0037	0.0086	0.0123
117	0.02685	0.01343	0.0171	0.0208	0.0037	0.0085	0.0123
118	0.02662	0.01331	0.0169	0.0206	0.0037	0.0085	0.0122
119	0.02640	0.01320	0.0168	0.0205	0.0037	0.0084	0.0121
120	0.02618	0.01309	0.0167	0.0203	0.0037	0.0083	0.0120
121	0.02596	0.01298	0.0165	0.0202	0.0037	0.0083	0.0119
122	0.02575	0.01288	0.0164	0.0200	0.0036	0.0082	0.0118
123	0.02554	0.01277	0.0163	0.0199	0.0036	0.0081	0.0118
124	0.02534	0.01267	0.0161	0.0197	0.0036	0.0081	0.0117
125	0.02513	0.01257	0.0160	0.0196	0.0036	0.0080	0.0116
126	0.02493	0.01247	0.0159	0.0195	0.0036	0.0079	0.0115
127	0.02474	0.01237	0.0157	0.0193	0.0036	0.0079	0.0114
128	0.02454	0.01227	0.0156	0.0192	0.0036	0.0078	0.0114
129	0.02435	0.01218	0.0155	0.0191	0.0036	0.0078	0.0113
130	0.02417	0.01208	0.0154	0.0189	0.0035	0.0077	0.0112
131	0.02398	0.01199	0.0153	0.0188	0.0035	0.0076	0.0112
132	0.02380	0.01190	0.0152	0.0187	0.0035	0.0076	0.0111
133	0.02362	0.01181	0.0150	0.0185	0.0035	0.0075	0.0110
134	0.02344	0.01172	0.0149	0.0184	0.0035	0.0075	0.0110
135	0.02327	0.01164	0.0148	0.0183	0.0035	0.0074	0.0109
136	0.02310	0.01155	0.0147	0.0182	0.0035	0.0074	0.0108
137	0.02293	0.01147	0.0146	0.0181	0.0035	0.0073	0.0108
138	0.02277	0.01138	0.0145	0.0179	0.0034	0.0072	0.0107
139	0.02260	0.01130	0.0144	0.0178	0.0034	0.0072	0.0106
140	0.02244	0.01122	0.0143	0.0177	0.0034	0.0071	0.0106
141	0.02228	0.01114	0.0142	0.0176	0.0034	0.0071	0.0105
142	0.02212	0.01106	0.0141	0.0175	0.0034	0.0070	0.0105
143	0.02197	0.01098	0.0140	0.0174	0.0034	0.0070	0.0104
144	0.02182	0.01091	0.0139	0.0173	0.0034	0.0069	0.0103
145	0.02167	0.01083	0.0138	0.0172	0.0034	0.0069	0.0103
146	0.02152	0.01076	0.0137	0.0171	0.0034	0.0068	0.0102
147	0.02137	0.01069	0.0136	0.0170	0.0034	0.0068	0.0102
148	0.02123	0.01061	0.0135	0.0169	0.0034	0.0068	0.0101
149	0.02108	0.01054	0.0134	0.0168	0.0033	0.0067	0.0101
150	0.02094	0.01047	0.0133	0.0167	0.0033	0.0067	0.0100
151	0.02081	0.01040	0.0132	0.0166	0.0033	0.0066	0.0099
152	0.02067	0.01033	0.0132	0.0165	0.0033	0.0066	0.0099
153	0.02053	0.01027	0.0131	0.0164	0.0033	0.0065	0.0098
154	0.02040	0.01020	0.0130	0.0163	0.0033	0.0065	0.0098
155	0.02027	0.01013	0.0129	0.0162	0.0033	0.0065	0.0097
156	0.02014	0.01007	0.0128	0.0161	0.0033	0.0064	0.0097
157	0.02001	0.01001	0.0127	0.0160	0.0033	0.0064	0.0096
158	0.01988	0.00994	0.0127	0.0159	0.0033	0.0063	0.0096
159	0.01976	0.00988	0.0126	0.0158	0.0033	0.0063	0.0095
160	0.01964	0.00982	0.0125	0.0158	0.0032	0.0063	0.0095
161	0.01951	0.00976	0.0124	0.0157	0.0032	0.0062	0.0095
162	0.01939	0.00970	0.0123	0.0156	0.0032	0.0062	0.0094
163	0.01927	0.00964	0.0123	0.0155	0.0032	0.0061	0.0094
164	0.01916	0.00958	0.0122	0.0154	0.0032	0.0061	0.0093
165	0.01904	0.00952	0.0121	0.0153	0.0032	0.0061	0.0093
166	0.01893	0.00946	0.0120	0.0153	0.0032	0.0060	0.0092
167	0.01881	0.00941	0.0120	0.0152	0.0032	0.0060	0.0092
168	0.01870	0.00935	0.0119	0.0151	0.0032	0.0060	0.0091
169	0.01859	0.00929	0.0118	0.0150	0.0032	0.0059	0.0091
170	0.01848	0.00924	0.0118	0.0149	0.0032	0.0059	0.0091
171	0.01837	0.00919	0.0117	0.0149	0.0032	0.0058	0.0090
172	0.01827	0.00913	0.0116	0.0148	0.0032	0.0058	0.0090
173	0.01816	0.00908	0.0116	0.0147	0.0032	0.0058	0.0089
174	0.01806	0.00903	0.0115	0.0146	0.0031	0.0057	0.0089
175	0.01795	0.00898	0.0114	0.0146	0.0031	0.0057	0.0089
176	0.01785	0.00893	0.0114	0.0145	0.0031	0.0057	0.0088
177	0.01775	0.00887	0.0113	0.0144	0.0031	0.0056	0.0088
178	0.01765	0.00882	0.0112	0.0144	0.0031	0.0056	0.0087
179	0.01755	0.00878	0.0112	0.0143	0.0031	0.0056	0.0087
180	0.01745	0.00873	0.0111	0.0142	0.0031	0.0056	0.0087
181	0.01736	0.00868	0.0110	0.0142	0.0031	0.0055	0.0086
182	0.01726	0.00863	0.0110	0.0141	0.0031	0.0055	0.0086
183	0.01717	0.00858	0.0109	0.0140	0.0031	0.0055	0.0086
184	0.01707	0.00854	0.0109	0.0140	0.0031	0.0054	0.0085
185	0.01698	0.00849	0.0108	0.0139	0.0031	0.0054	0.0085
186	0.01689	0.00845	0.0108	0.0138	0.0031	0.0054	0.0085
187	0.01680	0.00840	0.0107	0.0138	0.0031	0.0053	0.0084
188	0.01671	0.00836	0.0106	0.0137	0.0031	0.0053	0.0084
189	0.01662	0.00831	0.0106	0.0136	0.0031	0.0053	0.0083
190	0.01653	0.00827	0.0105	0.0136	0.0031	0.0053	0.0083
191	0.01645	0.00822	0.0105	0.0135	0.0030	0.0052	0.0083
192	0.01636	0.00818	0.0104	0.0135	0.0030	0.0052	0.0082
193	0.01628	0.00814	0.0104	0.0134	0.0030	0.0052	0.0082
194	0.01619	0.00810	0.0103	0.0133	0.0030	0.0052	0.0082
195	0.01611	0.00806	0.0103	0.0133	0.0030	0.0051	0.0082
196	0.01603	0.00801	0.0102	0.0132	0.0030	0.0051	0.0081
197	0.01595	0.00797	0.0102	0.0132	0.0030	0.0051	0.0081
198	0.01587	0.00793	0.0101	0.0131	0.0030	0.0051	0.0081
199	0.01579	0.00789	0.0101	0.0131	0.0030	0.0050	0.0080
200	0.01571	0.00785	0.0100	0.0130	0.0030	0.0050	0.0080

IF YOU MACHINE STAINLESS STEELS...

you'll want this new operating manual

"Machining of Stainless Steels" is a practical new operating manual based on the experiences of Armco engineers and service men in machine shops all over the country. You can get your copy of this valuable 38-page book by mailing the coupon on this page.

From cover to cover this book is full of facts about modern methods of stainless steel machining.

CUTTING SPEEDS AND FEEDS . . . .

You'll find tables of speeds and tool compositions for all kinds of machines—from turret lathes to automatic spindle machines. This book also gives you information on milling of stainless steels, including carbide milling.

MANY DETAILED SKETCHES . . . . . .

Correct clearances and angles for various tools are described in detail, with sketches that give actual working information on turning, milling and threading.

Helpful conversion tables along with finishes and tolerances of stainless steel bars and wire, are included in the book.

FILL IN AND MAIL THE COUPON FOR YOUR COPY

To put this useful manual to work for you just fill in and mail the coupon on this page. Meanwhile, if you need ARMCO Stainless Steel bars, wire, plates, sheets or strip, you can get quick delivery by writing The American Rolling Mill Company, 4063 Curtis Street, Middletown, Ohio. Or get in touch with your nearest ARMCO Stainless Distributor.

★ ★ ★ ★ ★

Help keep steel flowing from the mills by turning in your scrap promptly. The need is critical—the shortage *greater* than during the war.

ARMCO STAINLESS STEELS

THE AMERICAN ROLLING MILL COMPANY

ARMCO

THE AMERICAN ROLLING MILL COMPANY
4063 Curtis Street, Middletown, Ohio

Please send us free your new book on "Machining of Stainless Steels"

Name_____ **Title**_____

Company_____

Street Address_____

City_____ **Zone**_____ **State**_____

Selection of Stripper Springs

BY J. R. PAQUIN,
Tool Engineer,
Crompton & Knowles Loom Works

Selection and application of springs for stripper plates in modern high-speed dies need not follow the hit-or-miss method too often employed. Standard springs, selected from a catalog of die-makers' supplies, are accurately pressure-rated, and they are manufactured with great uniformity with respect to steel analysis, heat-treatment and dimensional tolerances. If correctly applied, they should give trouble-free operation for the life of the die.

A satisfactory formula for calculating the pressure required to strip the work from the punch, assuming normal punch clearance, is:

$$P = \frac{L \times T}{0.00117}$$

Where L = length of cut (In piercing operations, this is the sum of the perimeters of all the perforator faces)
T = Thickness of stock
P = Pressure in pounds, to effect stripping

In shaving operations, or on small sub-presses (where no clearance is allowed), the figure calculated by the formula should be doubled at least.

This formula is for "full stripping." In progressive dies, where only strips are to be run, and bridges, or weak spots, exist in the scrap strip, as at A, Fig. 1, the calculated figure may be materially reduced, depending on the number and length of the weak spots. But the value of P should never be reduced in applications where there is any possibility of scrap pieces from other operations being run through the die.

Three classes of deflection must be taken into consideration, Fig. 2. These are: (1) initial deflection to store up stripping energy; (2) working deflection, which is a fixed value, depending on the stock thickness, and (3) grinding deflection, which is normally ¼ in., but may be reduced to as little as ⅛ in. where space is limited.

Standard springs are rated in pounds per ⅛ in. deflection. Therefore, if a spring 1 in. dia. by 12 in. long is selected, and initial deflection is ¼ in., the total stored energy per spring will be twice the listed amount for that size of spring.

To this sum is added the pressure for the first ⅛ in. of working deflection. Should the working deflection be less than ⅛ in.—say 1/16 in., only one-quarter of the rated pressure could be used in the circulations.

For example:

Pressure per ⅛ in. deflection	= 20 lb.
¼ in. initial deflection, (2x20)	= 40 lb.
1/16 in. working deflection, (¼x20)	= 5 lb.
¼ in. grinding deflection, (2x20)	= 40 lb.
Total	= 85 lb.

Only the first ⅛ in. of working deflection can be used in the computation of stripping pressure.

The number of springs required is found by dividing the total pressure required to effect stripping by the "pressure per spring." If the number arrived at is out of proportion to the die, use fewer larger springs, or perhaps, more springs of a smaller size. Or pressure may be increased by applying more initial deflection.

Rules for Selecting Springs

1. For high-speed press work, both "medium" and "high pressure" springs should never be deflected more than one-fourth their free length.
2. For heavy, slow-moving presses, use "medium pressure" springs with a total deflection not to exceed three-eighths of the free length.
3. For hand tools, jigs and fixtures, use the full rated deflection.

Spring strippers have many advantages over solid strippers for many classes of die work:

1. In blanking, the strip is flattened and all waves are eliminated. Therefore, a more accurate part is produced.
2. The stock is held firmly between the die and pressure pad, thus insuring a cleaner fracture in piercing and blanking and reducing to a minimum the rounded edges caused by a slight drawing of the metal—typical of thin-stock work.
3. Reduced setup time. Since there are no knock-outs or extra attachments to connect and adjust, setup time is held to a minimum. An incidental advantage is the fact that there are no loose parts to get lost.
4. Since stripping is accomplished simultaneously with punch retraction, the danger of breaking slender piercing punches and frail die inserts is minimized. Also, the uneven abrasive wear on small punches, caused by the use of solid strippers is eliminated.
5. The open construction provides ready accessibility for loading and unloading second-operation work and, in progressive dies, for dislodging jammed work in cases of misfeeds.

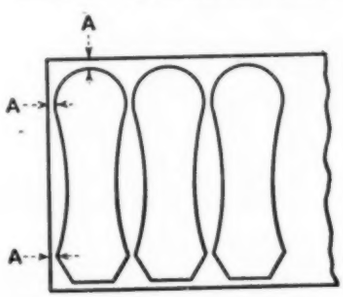


Fig. 1—Weak spots *A* in the scrap strip require reduction in stripping pressure

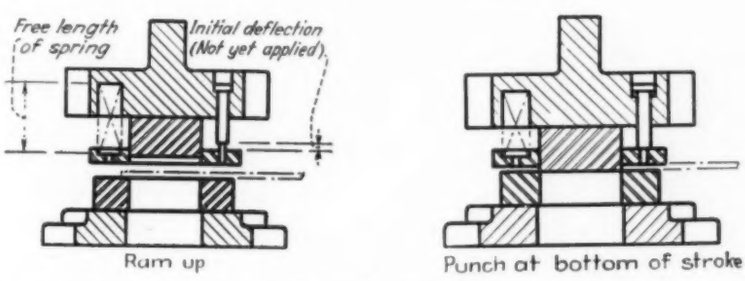


Fig. 2—After initial deflection is applied to stripper springs by tightening the bolts, the bearing face of stripper plate should project 1/32 in. beyond punch face. Working deflection equals this 1/32 in. plus stock thickness plus amount punch enters the die

Another New Britain Automatic with

initial and permanent accuracy

A NEW LINE OF PRECISION CONTOUR TURNING AND BORING MACHINES

Accurate and Fast — Cam and Air Actuated

Featuring

1. An endless variety of contours or combinations may be generated with a single-point tool. Besides all the regular jobs of straight precision boring and turning, facing and chamfering, it will produce lands, recesses, flanges, steps, counterbores, and radii

2. A disc type cam for each table gives positive action consistently throughout the day — from the first to the last piece — uninfluenced by temperature changes.

3. Through positive cam action, tool approaches on rapid traverse to within .005 of the work and immediately starts to feed Tool may cut on feed-in or drawback stroke, or both for rough and finish cuts. On return stroke, tool jumps clear eliminating drag off marks. When moving between intermittent or successive cuts, tool goes into rapid traverse.

4. Uniform temperature, anti-friction bearings, and super-precision spindles provide spindle speeds up to 7,500 RPM. Mechanical precision chucking operated by air cylinders. Neither chucking nor unchucking operation affects preload or position of spindle bearings.

5. Only one dimension need be inspected on any one set-up, regardless of the number of diameters produced by any one single-point tool. Cams control and positively repeat from piece to piece.

6. Set-up of machine depends entirely upon nature of job. Work may be rotated in spindles or mounted on table, loaded from the front of the spindle or through the spindle. Spindles may be raised, lowered, or separated. Two spindles are standard, but more may be added. Changing job set-up simply requires replacing two cams, setting tool for size and changing chucks.

Model 36

THREE OTHER NEW MACHINES

Latest additions to the New Britain line include: The new, faster, more powerful line of automatic screw machines designed to make the most of carbides on long and short runs, the Model 365, tool rotating, double end chucking machine — and the new line of automatic turret lathes.

THE NEW BRITAIN MACHINE CO. NB

NEW BRITAIN

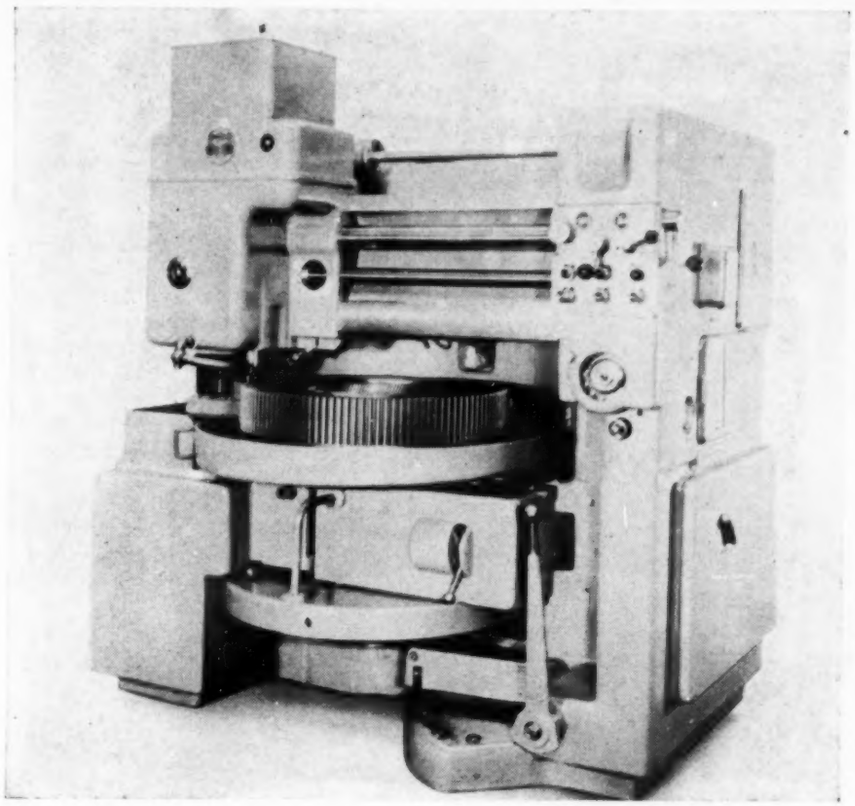
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

M-01064

Shop Equipment News

Fellows 36-in. Gear Shaper Cuts Spur and Helical Gears



Maximum pitch-diameter capacity, external and internal, is 36 in.

A 36-in. gear shaper for general-purpose gear cutting has been developed by Fellows Gear Shaper Co., Springfield, Vt. Of massive construction, it is adapted to the cutting of internal and external spur and helical gears.

The one-piece cutter spindle takes a 5-in. cutter and is operated by a heavy reciprocating mechanism. The saddle carrying the spindle is of heavy design with square-lock gibs.

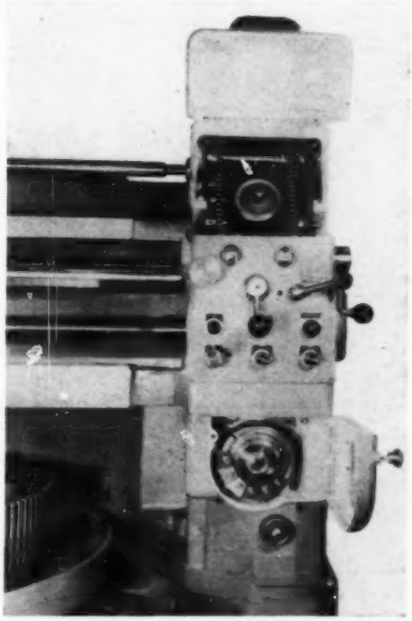
The work spindle has a 5⅞-in. hole. This spindle is carried by an apron supported in the base integral with the cabinet. A relieving and locking mechanism locks the apron in cutting position, and the relieving cam can be changed without removing the crankshaft.

There are 12 reciprocating speeds, from 18 to 300 strokes per min., which are obtained through a dial on the front of the machine. Four rotary feeds are obtained through a four-speed transmission controlled by a feed-shift lever. Two pick-off gears are changed to provide additional feeds.

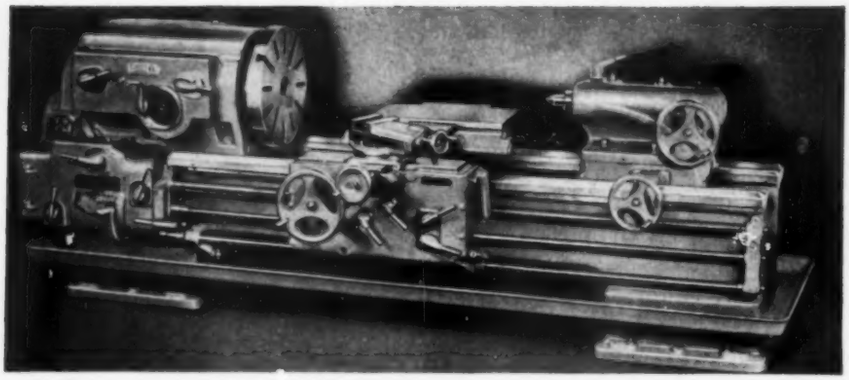
Depth feed is controlled by an arrangement which employs limit switches and adjustable dogs. The cutter can be fed into depth by independently adjustable steps determined by the number and position of the dogs. Rotation of work at any depth of cut is determined by a counter, driven from the lower index-wheel wormshaft, which operates electrical contacts at each complete revolution of the work.

The machine is set into operation by first turning the "power-on" switch. This starts the lubrication pump and brings power to the "start" button. The "start button is pressed to start cutter reciprocation and rotation of cutter and work. The cutter feeds into work until the first dog operates a limit switch. At the same point the counter clutch coil is deenergized to start rotation count of the work. At the end of one rotation (when work has been cut to uniform depth) the counter contact operates and causes the cutter to again start to feed into the work. Rotary feed progresses as before until the next dog engages the limit switch. This cycle is repeated for each dog until the final cut is taken, and then the machine stops automatically.

Diametral-pitch capacity of the machine is 3 spur, 4/5 helical. Max. face width, external and internal, is 5 in. Max. helix angle, standard guides, is 45°.



Close-up shows electrical control panel, cutter reciprocating-speed-selector mechanism, and depth-feed control drum and adjustable dogs



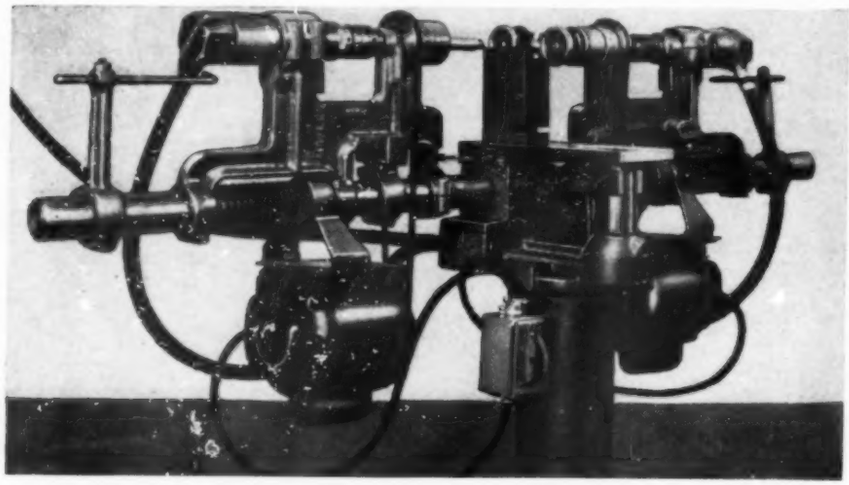
Sidney Heavy-Duty Engine Lathe Has 16-Speed Dial, 25-in. Swing

A 25-in. heavy-duty engine lathe has been released by The Sidney Machine Tool Co., Sidney, Ohio. It features a 16-speed dial controlled from the herringbone-geared headstock.

Spindle and intermediate shafts on the unit are supported by center bearings in addition to the conventional end-bearing supports. A rotary pump and filter provide automatic lubrication to all bearings and moving parts.

The gear box provides 48 changes of threads from ¾ to 46, and 48 changes of feeds from 0.003 to 0.207 in. per spindle rev. The gear-box unit has a closed-interior design, which is said to prevent dirt and chips from entering.

The apron has double wall construction. The tailstock handwheel is mounted on the side for operator's convenience, and a gear-reduction unit is provided to position the tailstock along the bed.



Horizontal Double-End Airflex Riveter Utilizes Rotating Impact

A horizontal double-end Airflex riveter utilizing the principle of rotating impact has been announced by the Lemert Engineering Co., 1200 N. Western Ave., Plymouth, Ind. It is used for riveting wheels on the axle of any wheeled toy, for simultaneously heading both ends of a tie rod, and for similar operations.

Two frames are mounted on a horizontal bar with cable and pulley arrangements which operate both hammers simultaneously when the pedal in the base is pressed. A holding fixture slides the work between the two riveting hammers. Hammers are available in four sizes.

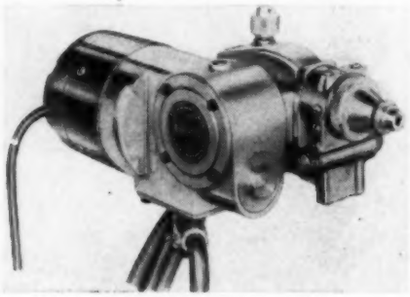
The rotating impact feature is said to combine precision-controlled straight-line pneumatic hammer blows with a fluted rotating peen. The peen strikes as it is rotated by an electric motor to form a full tight head. The fluted peen is said to reduce the bending force of the blow to that which the rivet will withstand, making riveting possible in brittle material.

John Hill Plexiglas Templets Provide Permanent Facsimilies

John Hill Layouts, Mount Clemens, Mich., announces Plexiglas Magne-Plastic machinery templets providing permanent facsimiles, scaled to size, of machines and equipment. They are used in conjunction with a thin, transparent-plastic layout mat, ink-scribed in ¼-in. squares each representing 1 ft., on which an outline of the building or plant area can be drawn.

The templets are made from sheets of Plexiglas coated on one side with a photographic emulsion. Scaled drawings of equipment are reproduced as negatives on this exposed and developed emulsion. The resulting cut-out templet has an outline on the under side of the machine with necessary identification marks.

A print of the final layout is made by covering a smooth metal sheet with special printing paper, and placing the scribed transparent layout mat over the paper. The templets are then placed on top where they are held in any desired position by the attraction between small circular permanent magnets (inserted in a hole in the center of the templet) and the metal sheet. The setup is then exposed to quad-lamps and dedeveloped, resulting in a positive-reduction blue-on-white print.



Metallizing Metal Spray Gun Powered by Induction Motor

A metallizing gun powered by an electric motor is called the Moguelectric metal spray gun. It is made by Metallizing Co. of America, 1330 W. Congress St., Chicago 7, Ill. By using different combinations of gearing almost any spraying speed can be obtained. Air requirements are reduced and turbine adjustments are eliminated by an electric drive.

Powered with a 1/20-hp. constant-speed induction motor, uniform wire speed is said to be insured. Gear reduction is at the front end of the motor. Only adjustments are gases and air.

OUTPUT? ACCURACY?

"Really GOOD" says CENTURY MACHINE CO.

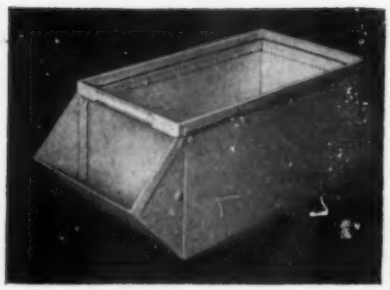
DO IT WITH A DUOMATIC

Duomatics are "Really GOOD" for production, is the opinion of Century Machine Company of Cincinnati, world famous producers of bakery machinery. Turning and facing gear blanks automatically, all the operator does is to start and stop the machine.

Men who really know . . . men who build fine machinery in their own plants quickly recognize the superiority of Lodge & Shipley 2-A and 3-A Duomatics. Comparing output, accuracy and time saved, they give Duomatic Automatic Lathes top ratings.

Lodge & Shipley Engineers will gladly show you authentic case histories, prove that even unskilled operators may out-produce several older lathes with a single Duomatic. Write for Bulletins 634 (3-A Duomatics) and 635 (2-A Duomatics.)

THE Lodge & Shipley COMPANY
CINCINNATI 25, OHIO
MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.



HOPPER-FRONTED lightweight stackbins are made of heavy-gage aluminum and designed for storage, transportation and assembly of tools, parts and materials. Made by Stackbin Corp., Pawtucket, R. I., the bins are stored in stackracks

Magnus Aja-Dip Cleaning Machine Locates Drive at Machine Front

The Equipment Div., Dept. AM-1, Magnus Chemical Co., Inc., Garwood, N. J., has redesigned and increased with new models the line of Magnus Aja-Dip cleaning machines.

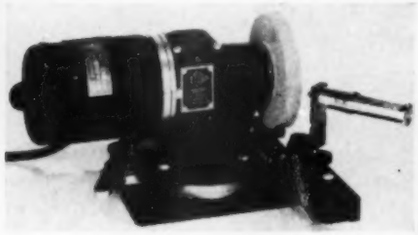
Drive mechanism is located in front of machine. Cleaning is automatic, requiring labor only for loading and unloading. Machines are available in 13 sizes and types, from the Midget type handling a few pounds of work to the Jumbo type handling 2200 lb. at a time. They can be used with either hot or cold cleaning solutions. If heated, steam, electricity, oil, gas or kerosene can be used.

Cleaning is obtained by mechanically raising and lowering the platform containing the dirty parts 60 times per min. through the cleaning solution, with an 8-in. vertical stroke. This would impart a shearing action to the cleaning solution.

Airco Oxyacetylene-Welding Flux Protects Molten Metal from Air

A flux compounded to dissolve the chromium oxides encountered in welding of stainless steels and high-chromium bearing alloys has been developed by Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y. The immediate and surrounding surfaces to be welded are painted to protect the molten metal from air.

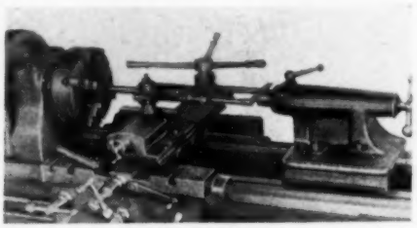
Known as Airco Formula No. 34, the flux is in ¼- and 1-lb. cans.



Diamond Wheels Dressed by Etco Without Removal from Spindle

A machine for dressing and shaping diamond wheels has been developed by Eastern Machine Tool Co., East Hartford, Conn. It is designed to remove dull diamond particles and bonding material from the face of the wheel, leaving a true face with new particles exposed. It is said to remove a minimum of material, thus increasing life of the wheel.

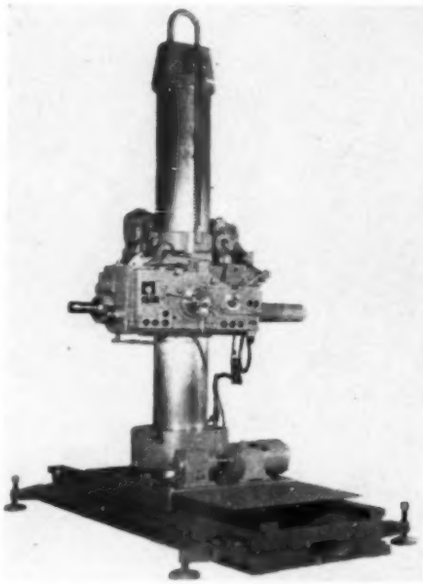
A radius attachment is added to make possible the cutting of angles in addition to straight facing. Machine consists, in principle, of small dressing wheel which is rotated at correct relative speed against diamond wheel to be dressed. Shaft housing permits a smooth reciprocating action to be given to dressing wheel. Mounted on a swivel base, the unit can be adapted to most machines which run diamond wheels.



McNaughton Keyseating Unit Uses Rack-Tooth Driven Spindle

A hand-operated keyseating attachment for lathes, used for cutting keyways, is announced by McNaughton & Co., 608 Sevier Ave., Knoxville 15, Tenn. The lever-operated movement of a rack-tooth driven spindle provides a means to power the cutting tool. When cutting keyways, the lathe carriage is clamped to the bed, and tailstock is brought up to prevent spring. Spindle has No. 4 Morse taper hole.

Kaukauna Drilling, Tapping Unit Features Tilting Horizontal Head



A portable or stationary horizontal drilling and tapping machine with a tilting horizontal head for unlimited number of drilling and tapping operations is introduced by Kaukauna Machine Corp., Kaukauna, Wis. The machine spindle can be placed in virtually any position: through power elevation of headstock on column; through column and sub-base traverse on runway; through tilting of headstock 45° above and below horizontal; and through rotation of the column 360° on its sub-base.

Listed as No. 1030, the unit has a fine feed to spindle through micrometer handwheel. An adjustable calibrated depth gage with automatic trip throws out feed at any predetermined depth within 6 in. of spindle travel, the starting point being anywhere within total spindle traverse. It also features an automatic tapping device with adjustable dial for tapping to a depth of 5 in. Full tapping cycle is completed with each depression of pushbutton control.

Machine has a capacity of 3 in. in cast iron, with a 3-in. dia. spindle, nine spindle speeds, three spindle feeds, 24-in. longitudinal continuous travel of spindle, and 48-in. horizontal travel of column on runway.

COSTS GO DOWN WHEN FRICTION GOES OUT

Faster production is very definitely a function of New Departure ball bearings.

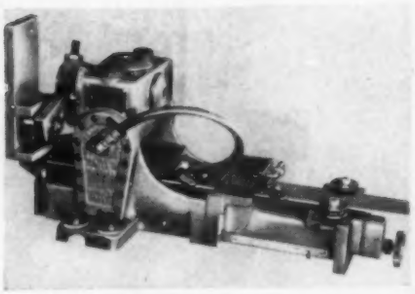
Operating with less friction, less wear, lower upkeep cost, the ball bearing is a "natural" for the higher speeds, greater rigidity and improved quality demanded by today's exacting production standards. Thus, an investment in machines of modern ball bearing design is an investment in faster production — lower costs.

nothing rolls like a ball

NEW DEPARTURE®

BALL BEARINGS

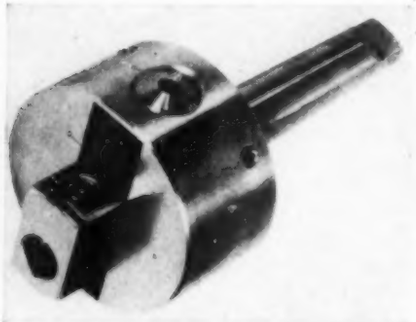
NEW DEPARTURE • Division of GENERAL MOTORS • BRISTOL, CONN. • Branches in DETROIT, CHICAGO, LOS ANGELES and Other Principal Cities



Haller Model D-600 Stock Feed Handles Stock to 4-in. Width

A hydraulically-operated stock feed for use on most punch presses has been developed by Haller Machine & Mfg. Co., Inc., 7940 Tireman Ave., Detroit 4, Mich. It handles stock to 4-in. width and 3/32-in. thickness and feeds any length from 0 to 5 in. Accuracy of feed is said to be within 0.003 to 0.005 in.

Known as Haller Model D-600 hydraulic stock feed, the unit is self-contained. It mounts on the bolster plate of the press and can feed from left, right, front or back. It is driven directly from the press ram, with ram stroke up to 6 in., and has enough power to pull stock through a roll-type straightener. All operating parts work in oil.



Nose Extends Beyond Body on Flynn Redesigned Boringhead

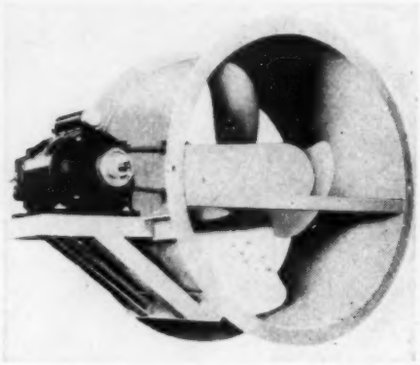
Redesign of the Flynn No. 12 offset boringhead is announced by Flynn Mfg. Co., 433 Bates St., Detroit 26, Mich. The body is now more compact, permitting extension of tool-block nose beyond the body for recessed and hard-to-reach jobs.

Wall of the tool grip has been increased ⅛ in. on each side. Length of tool grip has been increased ½ in. Space between ways has been reduced, thus centralizing the adjusting micrometer screw. A lock-tension screw is available for relieving strain on the hardened and ground micrometer screw in heavy work. Square hole adjusting screws are replaced by standard hex screws.

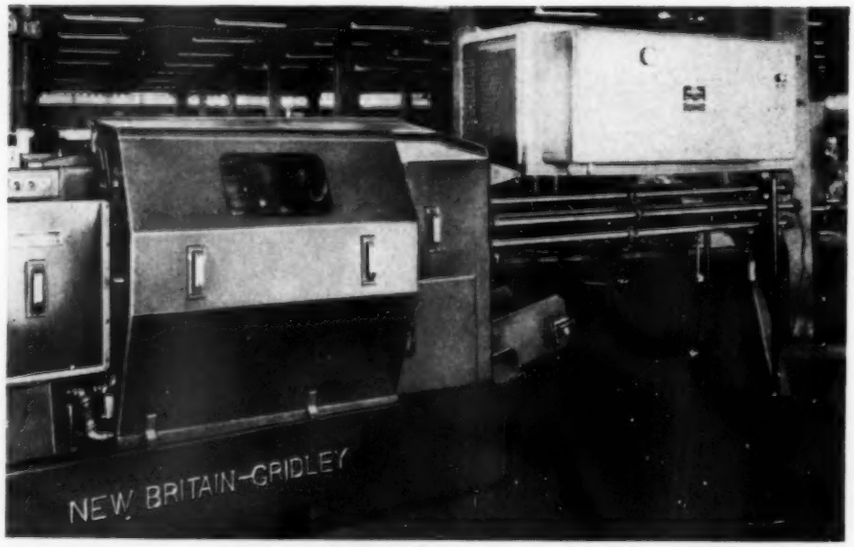
Metron's Electric Tachometers Provide Three Separate Ranges

Two multiple-range electric hand tachometers for general-purpose speed measurements in either rpm. or fpm. have been developed by Metron Instrument Co., 432 Lincoln St. Denver 9, Colo. Three separate ranges are provided on a 100-division, 3⅛-in. scale. Type 25A tachometer has ranges of 200 to 2000, 500 to 5000, and 1000 to 10,000 rpm. Type 25B for low speed has ranges of 20 to 200, 50 to 500, and 100 to 1000 rpm. Operating torque of head is approximately 1/20 oz.-in.

Both tachometers are available in a carrying case which also contains two 60° cone tips, a hollow cone tip, a tip extension, and 1-ft. and 1/10-ft. circumference disks for measuring linear speeds in fpm. Speed adapters for extending speed ranges up or down by a factor of 10:1 are also available.



HEAVY-DUTY booster fans for use in paint spray booths are made by Chelsea Fan and Blower Co., Inc., 1200 Grove St., Irvington, N. J. Called Series DXB, they are in five sizes from 16-in. propeller dia., 2000 cfm. and ¼-hp. motor, to 36-in. propeller dia., 9500 cfm. and ½-hp. motor. Unit is for either vertical or horizontal operation and has non-ferrous metal blades. Shafts and motors are ball bearing mounted



COOLANT-TEMPERATURE-CONTROL unit for application to New Britain-Gridley automatic screw machines is said to increase production by eliminating warm-up operations and subsequent tool adjustments. Coolant is kept at a pre-determined temperature by constant evaporation of moisture on the outside of tubes through which the hot coolant oil is flowing. Whether machine is idle or not, temperature of coolant is kept within two or three degrees of a pre-determined point, preventing contraction or expansion of working parts. Made by Niagara Blower Co., 405 Lexington Ave., New York 17, N. Y., and installed by New Britain-Gridley Division of the New Britain Machine Co., New Britain, Connecticut

3 to 10 times
more production than other carbides

WHAT a difference in production and costs, when you use Improved TECO Cemented Carbide! It produces 3 to 10 times more pieces than other carbides, yet costs no more. It stays on the job much longer—removes more metal—operates at higher speeds and feeds—gives a better finish.

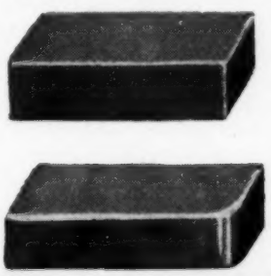
The same TECO Grade can be used for turning, facing and boring—rough and finish cut—as well as for precision boring and reasonable intermittent cutting. When no longer used for roughing, continue to use the tool for finishing, down to the last grind. No complicated stocks—no waste.

Tool up a carbide job with Improved TECO and judge it yourself. Send details of your machining problem for recommendation. Catalog and price list on request.

TUNGSTEN ELECTRIC CORP. 568 39th ST., UNION CITY, N. J.

Branch Office: 403 Western Reserve Bldg., Cleveland 13, Ohio
Representatives: Indianapolis. Ind., Detroit, Mich.

Manufacturers of
TECO CARBIDE BLANKS and TOOLS



All standard sizes and styles. When ordering any carbide tools specify "Teco —no substitute."

Another Typical Case:

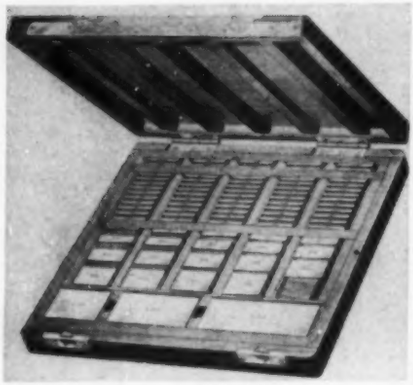
Part: Motor Shaft
Material: SAE 3140 Steel
Machine: Warner-Swasey Lathe No. 2A
Operation: Turning
Diameter: 1.468"
Depth of Cut: .284"
Feed: .011"
Length of cut: 6"
Speed: 460 rpm
PIECES PER GRIND: 150
Best previous carbide production: 40 pieces
TECO Grade C. used

You get:

- *More pieces between grinds*
- *More grinds per tool*
- *Less down time*
- *Lower tool cost with*

Improved
TECO
CEMENTED CARBIDE

Manufacturers of Tungsten Carbide—from ore to finished material—for over a quarter century.

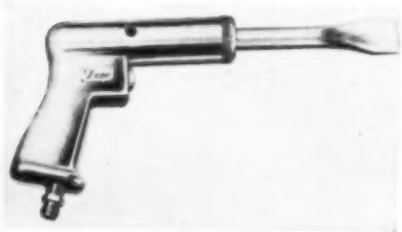


GAGE-BLOCK set, "A" accuracy, is made from alloy steel by Small Tool and Gage Div., Taft-Peirce Mfg. Co., Woonsocket, R. I. Blocks are hardened and seasoned and are marked for size on edge. Set contains assembly of all 81 standard sizes, as well as an additional 0.10005-in. block

Air Hydraulics Small Arbor Press Designed for Flanging, Broaching

A small air-hydraulic press with a capacity of 1200 lb. is announced by Air-Hydraulics, Inc. 401 Broadway, New York 13, N. Y. The press has been added to the line of 2½- and 6-ton models, and can be used for assembling, flanging, broaching, marking, riveting and similar operations.

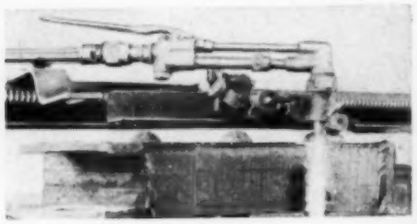
Air inlet pressure is 100 lb. The unit has a 6-in. throat, 2½-in. stroke, ¾-in. ram and 5-in. square platen. Spring or power return is optional.



Dow Air-Lubricated Hammers Feature Loose-Fitting Piston

A line of air-lubricated, air-cooled pneumatic hammers have been announced by Dow Pneumatic Tool Co., 39 S. La Salle St., Chicago, Ill. The tool does not follow the accepted principle of compression cylinders, and it has a loose-fitting piston. It requires only a few drops of oil occasionally to prevent corrosion.

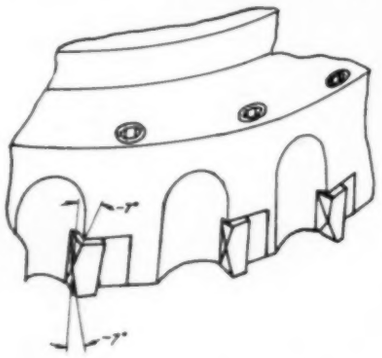
All hammers have a built-in safety toolholder. A light general-purpose hammer for riveting, scaling, scraping or cutting, and a medium-weight hammer for breaking plaster, chipping, and peening, are available.



Campbell's Screw-Feed Device Feeds Torch on Straight Line

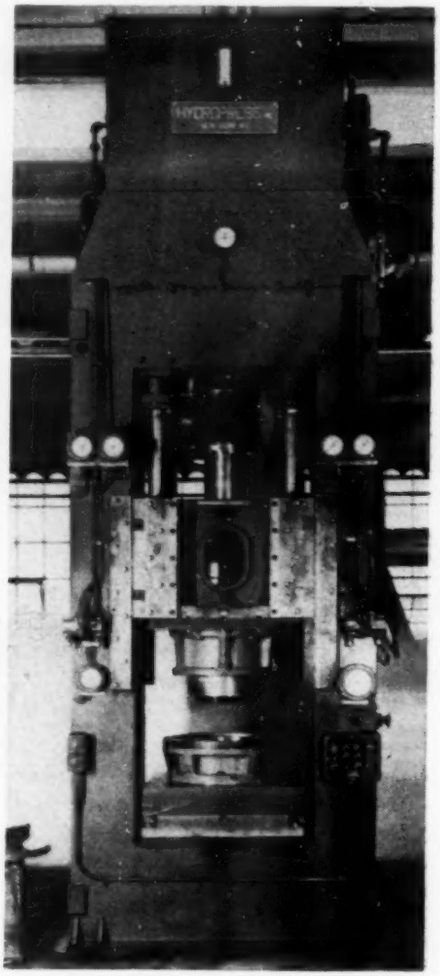
A screw-feed device has been developed by J. A. Campbell Co., 645 E. Wardlow Rd., Long Beach 7, Calif. It is said to make grinding and milling of torch-cut edges unnecessary except for precision finishes. The unit has a portable straight cutter which holds the torch and feeds it along a straight line at desired speed. Torch is moved along pre-determined line by turning a geared crank at the end.

Known as C & H Straight Line cutter, the device will hold any torch. It has an adjustable holder so the torch can be angled to cut bevel or scarf. A stainless-steel wheel rolling along the work keeps torch a uniform distance away. Cutter is 5 ft. long and weighs 42 lb.



Bi-Axial Grind by Super Tool Incorporated on Milling Cutter

Super Tool Co., 2165 Hoover Rd., Detroit 5, Mich., announces a grind for making heavy side- and face-milling cuts with solid-carbide-insert blade cutters. The Bi-Axial grind previously announced by Super Tool in connection with slotting cutters, is now incorporated on the grind. The combination of negative radial and two negative axial rake angles have a centering effect on the cutter said to stabilize the pressure and eliminate flutter.



Double-Action Deep-Drawing Press Has 150-Ton Capacity, High Speed

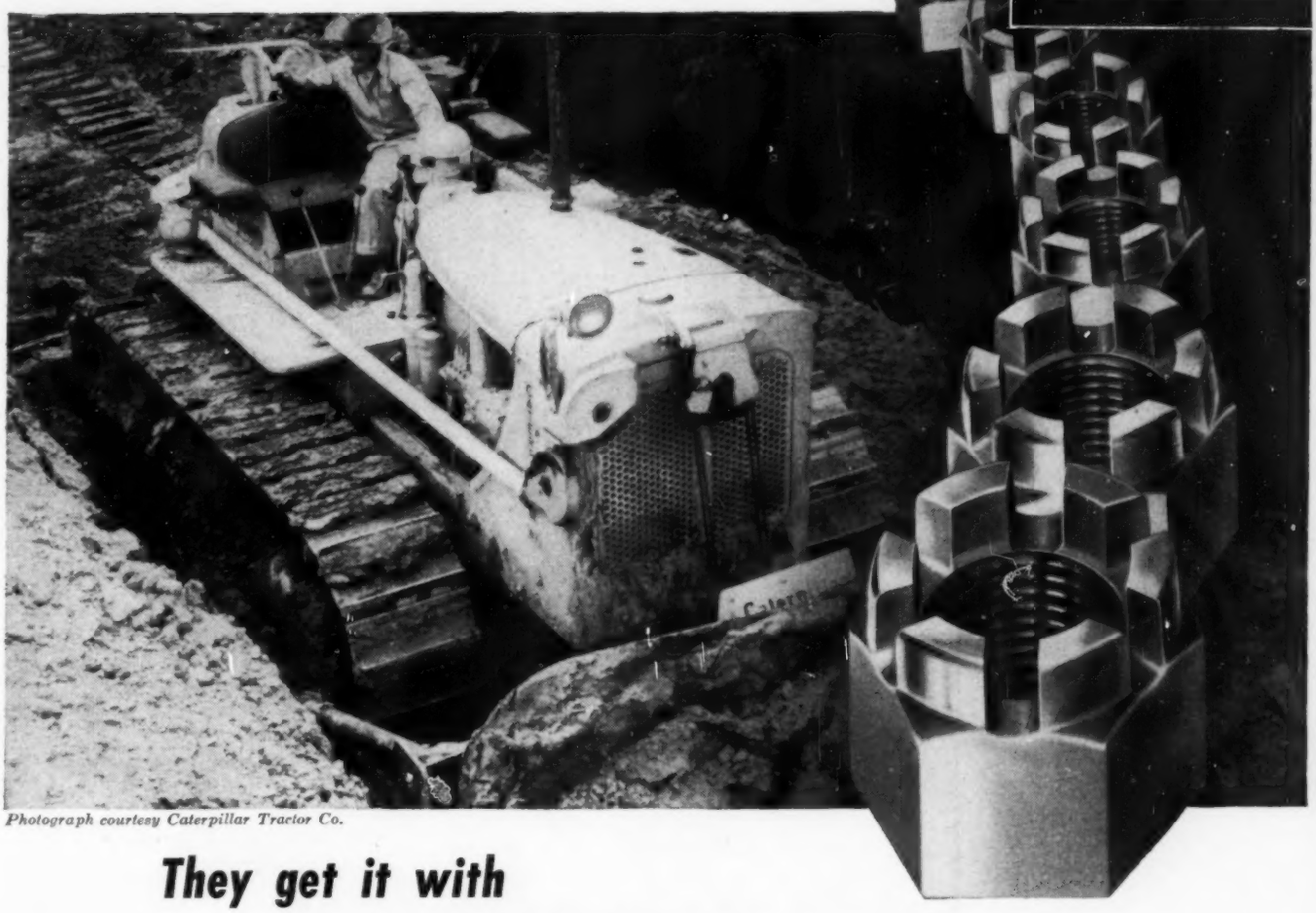
A high-speed oil-hydraulic double-action deep-drawing press is introduced by Hydropress, Inc., 570 Lexington Ave., New York 22, N. Y. The self-contained unit can have manual, semi-automatic, or automatic control. Complete drive with pumps and motors is mounted on the press. Pushbuttons actuate valves by means of solenoids.

Main slide has a capacity of 100 ton while the blankholder slide has a capacity of 50 ton. Both slides can be coupled together to obtain a total of 150-ton capacity for single-action work. Drawing speed can be obtained to 225 ipm., at pressures to 100 ton on the main slide, and fast advance and return speeds to 1200 ipm., depending on motor size.

"CATERPILLAR" *insists on* UNIFORMITY

Down to the last small nut . . .

J&L STEEL



Photograph courtesy Caterpillar Tractor Co.

They get it with
J&L ELECTREAT COLD FINISHED STEEL

On the vast prairie farms, highway and construction projects, strip mines . . . wherever there's a tough earth moving job to be done that requires plenty of steady, dependable power day in, day out . . . you'll find "Caterpillar" Diesel tractors.

The outstanding reputation built in service by these rugged monster machines stems directly from their maker's firm policy of building top quality into every product, every part.

Take this connecting rod nut, for instance. It's a small part in size but not in importance. So "Caterpillar" has it made of **J&L Electreat Cold Finished Steel.** Heat treating, handling and cleaning are eliminated in the process. Lower inventories are maintained because a production bottle neck has been cleared up. The result? A part of absolute uniformity, every one exactly the same, greater dependability—like all "Caterpillar" complete assemblies.

Other leading manufacturers have been quick to recognize the improvements *and actual savings* possible with **J&L Electreat Steel.** In making worm shafts, splines, studs, and many other parts, **Electreat** eliminates hardening and straightening operations, reduces inspection losses, replaces expensive alloy steels . . . and **Electreat** can be machined to complete satisfaction.

You, too, may be able to make a better product *at a saving* with **Electreat.** Why not place a trial order now and see for yourself what **Electreat** will do? The booklet offered in the coupon tells you how **Electreat** improves quality and saves in many ways. It is yours without cost yet it may prove to be priceless information.

Cold Finished Sales Dept.
716 Jones & Laughlin Bldg.
Pittsburgh 30, Pa.

Please send at once a copy of your booklet "J&L Electreat Steel."

Name _____ Title _____

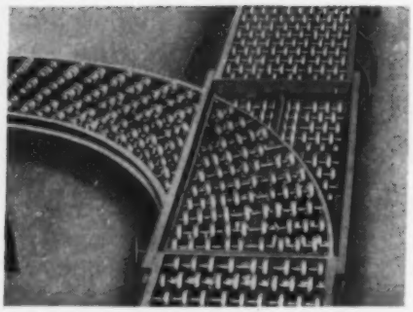
Company _____

Street _____

City _____ Zone _____ State _____

JONES & LAUGHLIN STEEL CORPORATION

J&L Electreat Cold Finished Steel will improve your product—Save money, time and steel



Sage's Conveyor-Line Switch Changes Direction by Rotating

Sage Equipment Co., 30 Essex St., Buffalo 13, N. Y., announces a switch which is constructed to eliminate complicated moving parts and increase conveyor line efficiency. It permits material to travel forward or to be diverted at 45 or 90°. Pulling of a lock-pin allows the center portion to swing on its own axis, allowing straight-ahead or curved side of switch to be used. The switch is made in standard widths and in special sizes.

Griswold Optical Dividing Head For Indexing and Inspection

An optical dividing head is announced by F. T. Griswold Mfg. Co., Lancaster Ave., Wayne, Pa. When used on a milling machine, it permits direct selection of any angular division, whether an even degree or not. It can also be used for inspection of ratchets, gears and cam profiles, and other locations usually obtained by means of mechanical dividing heads or indexing machines.

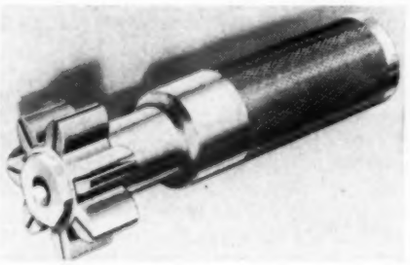
The optical dividing head does not depend upon gears or mechanical parts for accuracy. It consists essentially of a spindle mounted on precision bearings. A handwheel, fastened to a worm for rapid indexing, provides spindle rotation. For finer adjustments a knurled screw is used. The worm can be completely disengaged by lever, enabling spindle to be rotated by hand. A drum graduated in degrees is shrunk and keyed into the spindle. The graduated divisions on drum are magnified ten times and show clearly through the lens.

Center distance from base is 6 in. Instrument weighs 110 lb., is 12x12x14 in., and has 12-in. swing.

Baker 1000-lb. Capacity Truck Applicable in Limited Areas

A center-control fork truck of 1000-lb. capacity has been introduced by Baker Industrial Truck Div., The Baker-Raulang Co., 2168 West 25th St., Cleveland 13, Ohio.

Known as the Type FQH-10, the unit is used where floor space is limited or areas are congested. It has 36-in. wheelbase and an over-all length, exclusive of forks, of 53⅝ in. It takes a 1000-lb. load 30 in. long, makes a right-angle turn in 67½ in. (plus length of load), and is 28 in. wide. Travel controller provides three speeds forward and reverse. Battery has a capacity for 12 hr. of work. The motor-generator-type charger is automatic.

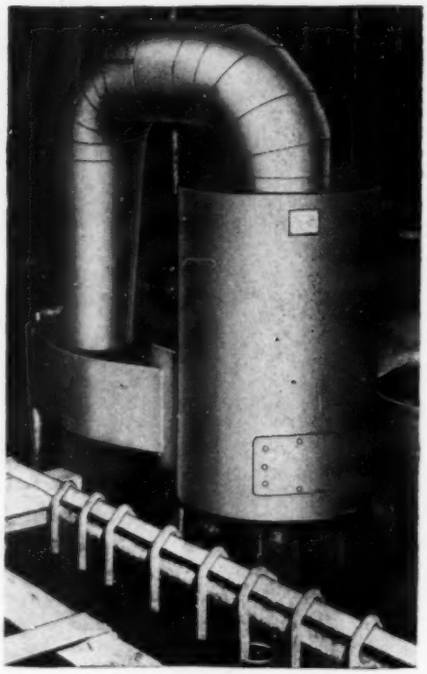


MP's Adjustable Tooth Form Varies Thickness of Tooth

An adjustable tooth form providing variable thickness of tooth by retaining full profile bearing has been developed by MP Tool & Engineering Co., 2339 Caniff Ave., Detroit 12, Mich. The tooth has individual left-side and right-side profiles extending through the full width of the gear. These profiles are rolled into or away from each other to vary tooth thickness or tooth space.

It is said that all tooth forms are made adjustable by the unit. As a gaging device, it is said to eliminate double-checking operations with "go" and "no go" gages.

It is claimed that the tooth form is an answer to problems such as concentricity, wear and engineering-specification changes. The adjustable-tooth principle of the unit is applied to work-holding devices such as: adjustable self-centering mandrels; spline and gear chucks; and spline and gear adaptors.



Electroplating-Fume Separator Cleans Air by Water Absorption

A fume separator which cleans contaminated air without the loss of room heat has been introduced by Industrial Electroplating Co., Inc., 219 West Vermont St., Indianapolis, Indiana.

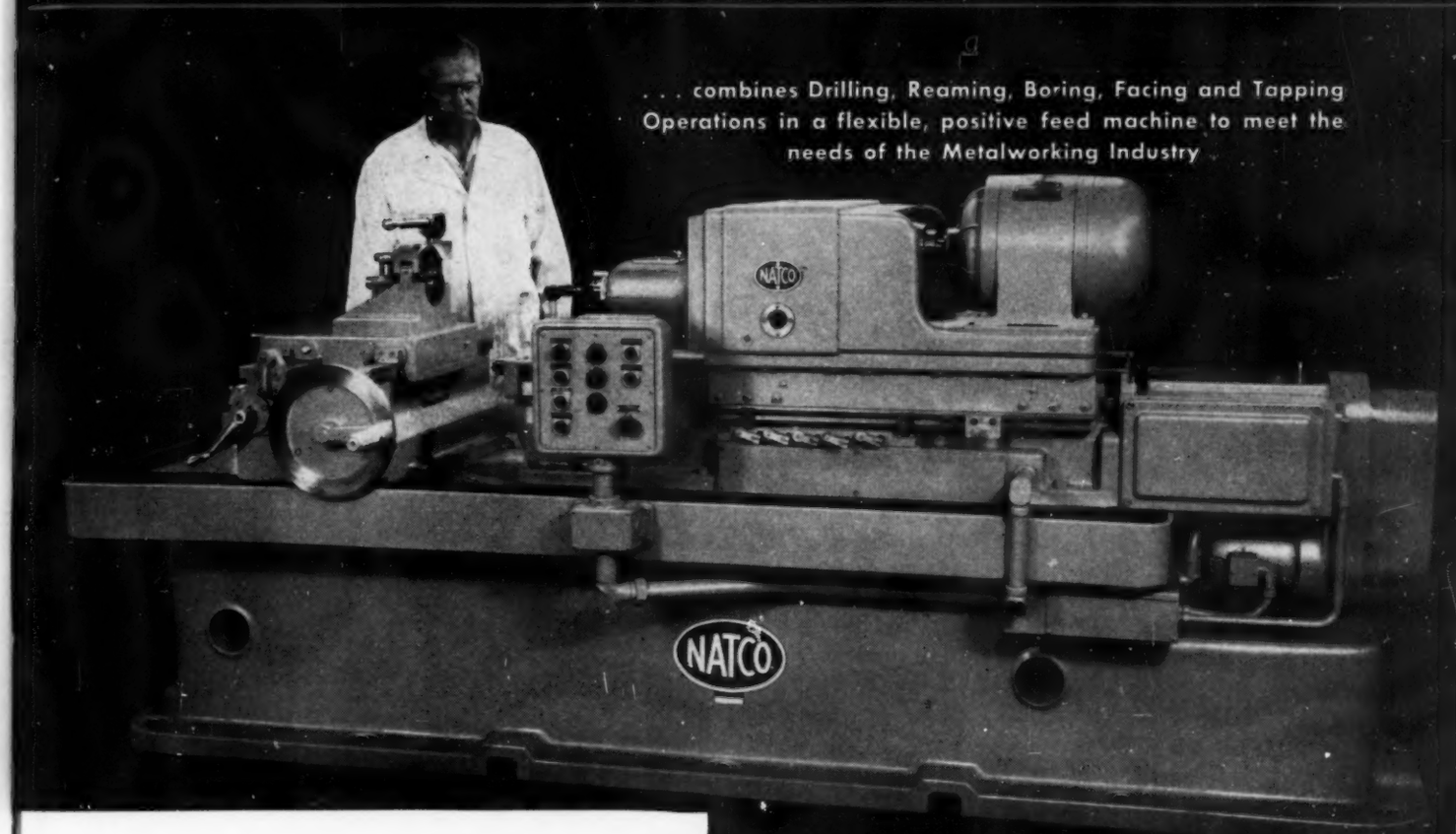
The unit draws contaminated air off electroplating tanks, cleans it by water absorption and centrifugal separation, and returns pure air to the shop. The unit is said to utilize a minimum of ductwork.

The air cleaner can be used for the control of fumes from such solutions as anodizing, caustic soda, chromic acid, and all cyanide solutions. Two models are available with capacities of 1,500 and 3,000 cfm.

New NATCO A-42 ELECTRONIC

Mechanical Feed Unit... Entirely Self-Contained

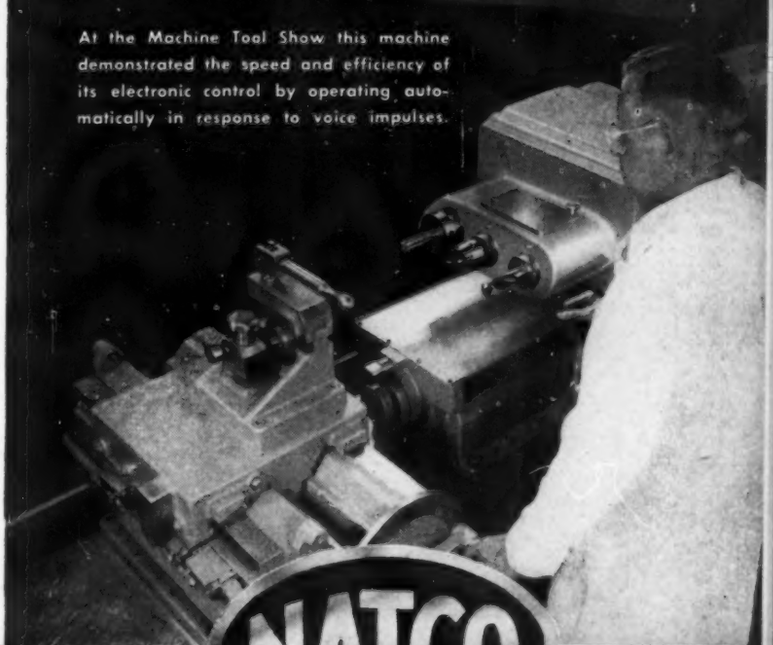
FEEDS IN BOTH DIRECTIONS



. . . combines Drilling, Reaming, Boring, Facing and Tapping Operations in a flexible, positive feed machine to meet the needs of the Metalworking Industry

This highly adaptable NATCO A-42 Electronic Mechanical Feed Unit provides electronically controlled automatic work cycles such as rapid traverse forward, coarse feed forward, fine feed forward, dwell, rapid traverse return, and stop, or rapid traverse forward, feed forward, feed backwards, rapid traverse return, and stop, and many other combinations. The unit can be mounted in any position to form a part of highly specialized machines made up of combinations of NATCO units for high production of a wide variety of work. Write Dept. A for NATCO Bulletin 747.

NATCO DRILLING, BORING, TAPPING AND FACING MACHINES



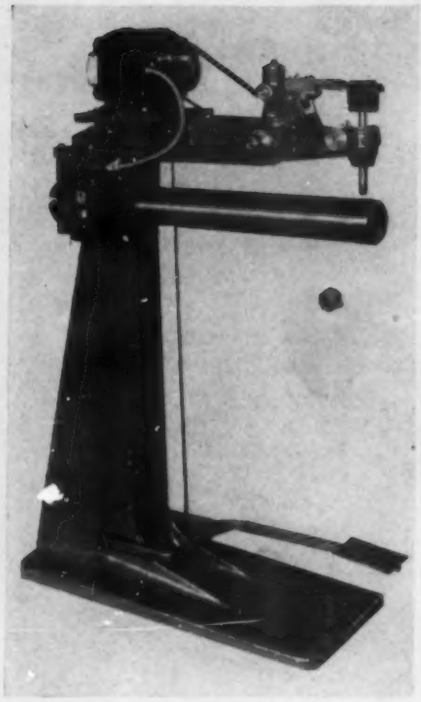
At the Machine Tool Show this machine demonstrated the speed and efficiency of its electronic control by operating automatically in response to voice impulses.

NATCO

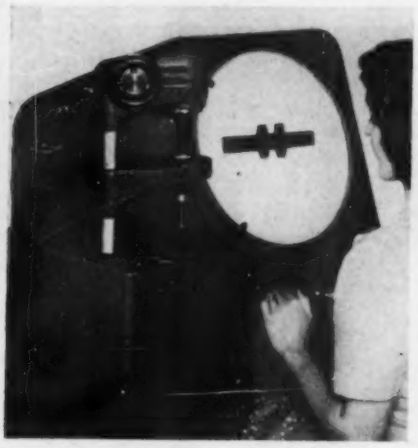
NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U. S. A.

Branch Offices: 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit • 1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

Call a Natco Field Engineer



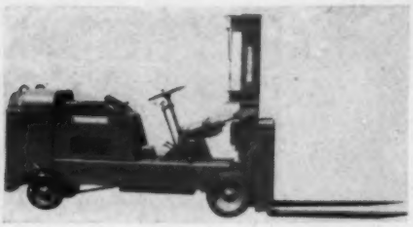
RIVETING HAMMER has 24-in. long steel arbor, is especially suited for sheet-metal work, and has capacity from 1/8- to 1/4-in. dia. rivets. Units having greater or lesser capacities are available. Made by The High Speed Hammer Co., Inc., 313 Norton St., Rochester 5, N. Y.



Inspection, Assembly Operations Handled by Wilder Comparator

A Wilder projector and optical comparator is marketed by George Scherr Co., 200 Lafayette St., New York 12, N. Y. The instrument is suitable for continuous-quantity inspection as well as for the performance of delicate assembly operations on minute parts as occur in the watch, instrument and electronic tube industry. Work stage and observation screen are close to each other, within operator's reach and line of vision respectively. Lamphouse is located overhead leaving both stage and screen unobstructed. An arm rest is provided which is part of the cast base.

When used for shadow images the unit offers a choice of six different magnifications: 10, 20, 31¼, 50, 62½, and 100×. Circular screen has 14½-in. diameter.

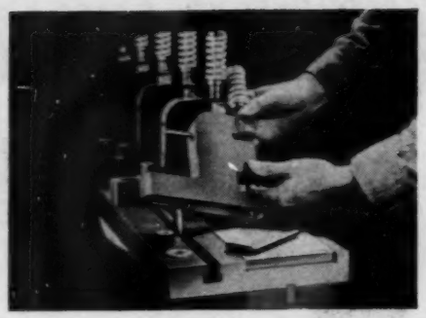


FORK LIFT TRUCK, Model LT-90, has been announced by Towmotor Corp., 1226 East 152nd St., Cleveland 10, Ohio. With a lifting capacity of 15,000 lb., it can be used for heavy industry, and can also be used in conjunction with various Towmotor accessories

Ajax Isothermal Quench Furnace Employs Heat-Exchange Principles

An isothermal quench furnace, for use with the Ajax isothermal heat-treating process, has been announced by Ajax Electric Co., Frankford at Delaware Ave., Philadelphia, Pa. It acts as a heat exchanger to hold the quenching bath at constant temperature, and it is provided with a submerged pump with outlets that subject work to a fast-moving stream of molten salt.

A salt separator which is immersed directly in the quench bath is comprised of a screen filter and an air pump, and is said to eliminate the problem of contamination of the low-temperature quenching bath by salt carried over with work for the high-temperature austenitizing bath.



Hole-Punching Unit for Series Punching of Angles, Channels

The Wales heavy-duty Type EJ hole-punching unit has been introduced by Wales-Strippit Corp., North Tonawanda, N. Y. Designed with a center projection to carry the die, the unit punches a series of holes simultaneously in angles, channels and extruded shapes. The center projection can be located to punch these various extruded sections.

Units are independent and self-contained. Nothing is attached to press ram. All functioning parts—punch, guide, stripping spring and die—are built in the holder which automatically aligns punch and die. Illustration shows how unit is set up by means of pilot pin which fits into "strip" templet (*AM*—Nov. 6, '47, p. 170) and by bolt which fits into T-slot.

Smyrna's All-Aluminum Buggy Handles Shop Loads to 300 lb.

An industrial handling buggy designed for lightness and strength is made by Smyrna Industries, Inc., Smyrna, Ga. The all-aluminum buggy weighs 12.5 lb., is 27.5x17x27 in. high, and handles loads up to 300 lb. Height to handle is 36 in. The decks are designed to take trays, boxes or to handle pallets. Buggies are made to any specifications.

To help you get SPECIAL TAPS Quicker

"M-11"

*'Detroit' also stocks special blanks of "M-11" for quick grinding to your specifications.

Shown here are a few typical Detroit Tap and Tool Company M-11 *special* taps currently carried *in stock* in addition to standard taps.*

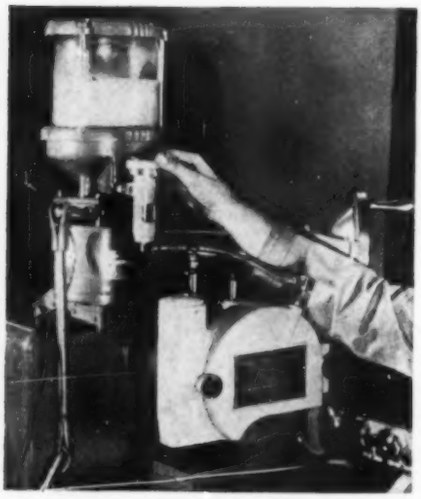
While it is obviously impossible to stock every special tap, it is our policy to maintain a floating bank of such taps for large tap users, so that they can secure immediate delivery on their re-orders.

You, too, can insure immediate delivery of your special taps and cut your own inventory requirements at the same time by specifying M-11 taps—the only taps that are made of this remarkable, long-life, tough and shock-resistant chrome cobalt high speed steel.

They cost no more! They last longer! You can get them quicker!

Murray Murco Tumbling Barrel Allows Wide Range of Speeds

The Murco tumbling barrel is announced by D. J. Murray Mfg. Co., Wausau, Wis. The unit deburrs, burnishes, cleans, polishes and surfaces metal and plastic parts on a mass-production basis. Speed changes can be made while barrel is in motion, giving a wide range of available speeds. Specially designed dump pans, mounted on casters, have funnel-shaped discharge end which fits in compartment opening to facilitate loading. Separating screens can be mounted in frames to fit pans. All moving parts are protected with guard rail or enclosures.

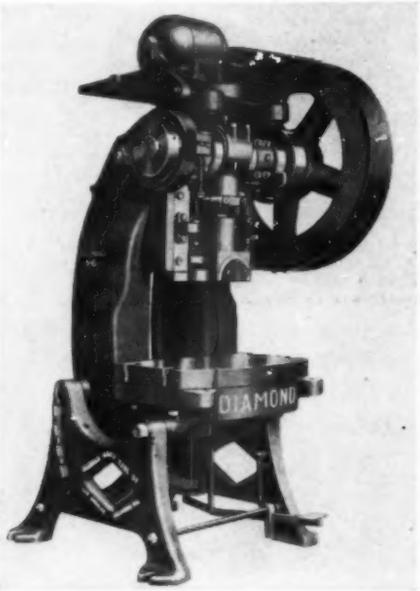


Cool Grinding Method by DoAll Directs Coolant to Contact Point

A method of cooling work during grinding called Cool Grinding has been developed by The DoAll Co., Des Plaines, Ill. Coolant is introduced at point of contact between wheel and work. The system is said to eliminate need for splash guards, settling tanks, pump motors and similar equipment.

Unit consists of a coolant reservoir mounted on spindle column, a sight drip valve and a wheel adapter. Coolant is fed from reservoir at rate of from one to four drops per sec., depending upon material being ground. Coolant is directed into the front of the special wheel adapter where it enters the arbor hole of the grinding wheel at the inside, and is thrown to the outside grinding face by centrifugal force.

Temperatures are claimed to be held several hundred degrees below those found in conventional wet-grinding systems. Because the coolant flows through the wheel it flushes the grinding surface and keeps it clean. Unit is now available as an attachment for DoAll 6x18-in. surface grinders, and will be soon offered for other makes of surface grinders as well as for bench, cylindrical, centerless, and internal grinders.

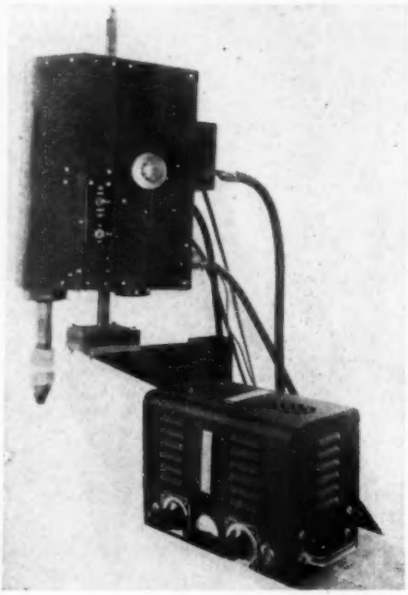


Diamond Plain-Type Punch Press In 55- and 56-Ton Capacities

A plain-type punch press, made in 55- and 56-ton capacities, is offered by Diamond Machine Tool Co., Los Angeles, Calif. Frames are of open-back, inclinable construction with bearing and sliding surfaces micro-finished. Frame sections are designed to provide increased strength at points of maximum stress as shown by strain-gage analyzer.

Clutch employs three sets of driving dogs that engage flywheel at any 120° angle of rotation. Clutch dogs are oversize, and are fully supported within clutch housing. This is said to eliminate bending stress, thus placing the dog almost entirely in shear. Fatigue failures at this point are said to be eliminated.

The 56-ton model has a standard stroke of 3 in., and a maximum 100 strokes per min. The bed area is 20x30 in. The strain-gage analysis discloses frame strengths as high as five times rated capacity, with no increase in weight of main casting.



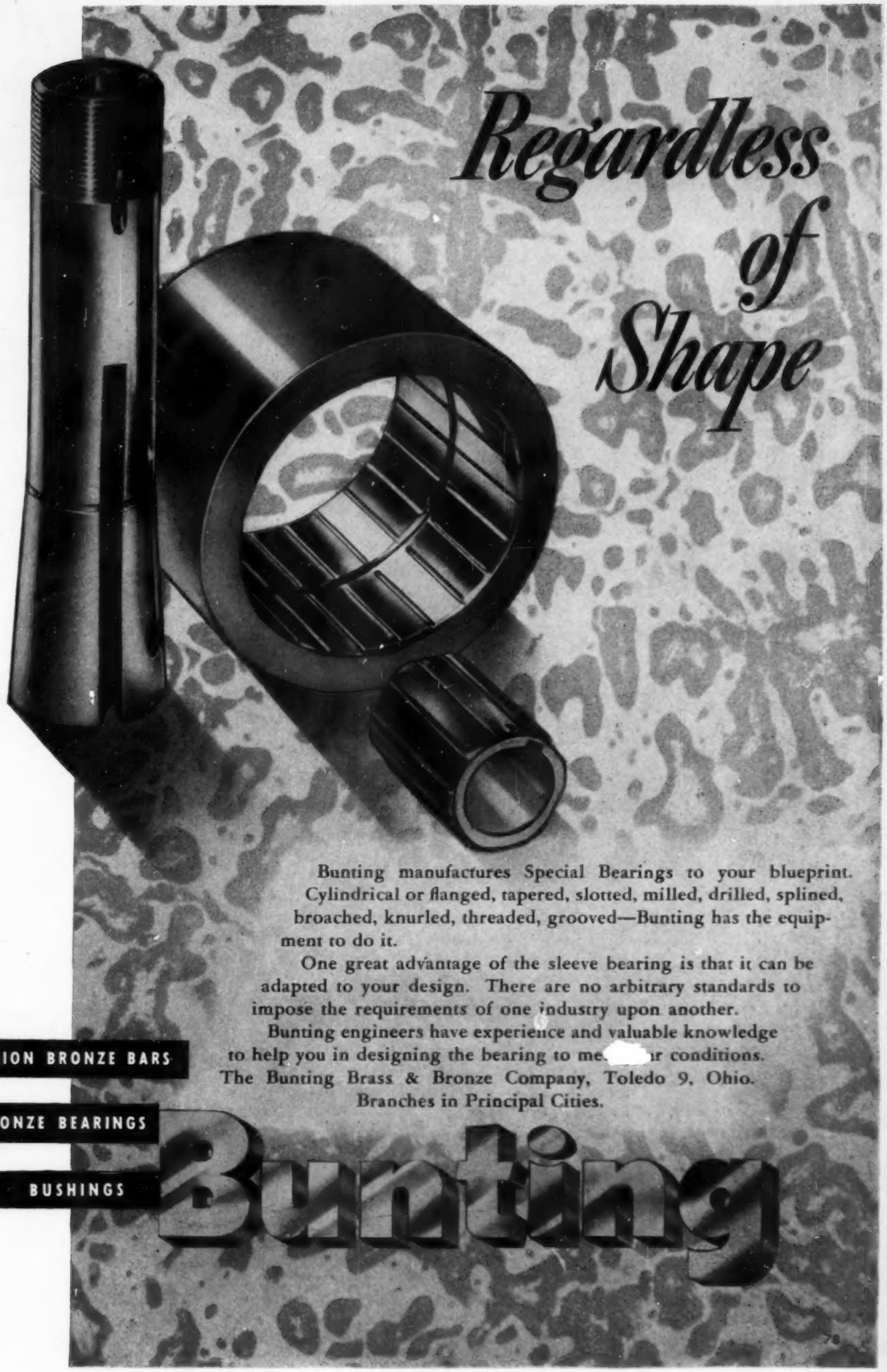
Two Airco Heliwelding Units Perform Light-Metal Welding

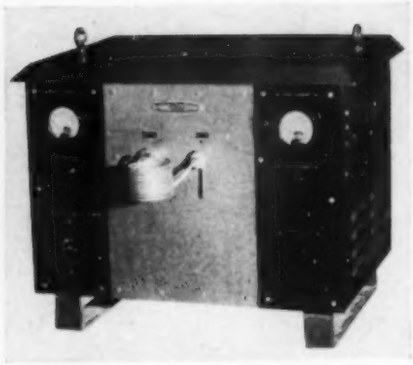
Two Heliwelding units, a machine-type electrode holder and an automatic unit, have been announced by Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y. They are for high-speed welding of light metals such as stainless steel, aluminum and magnesium.

The machine holder can be mounted on a Radiograph or other travel mechanism and either moved along joint or used in a fixed position with work moving beneath the arc.

The Airco automatic Heliweld unit (illustrated) is designed for continuous operation. It consists of a holder, holder carriage and control box. Electronically controlled, it automatically maintains constant arc length.

Both units have welding-current capacity of 300 amp. The machine holder can be used either with ac. or dc., while the automatic unit operates on dc. only. Holders supplied with either type of equipment are virtually indentical. A holder is water-cooled, 10-in. long, and takes tungsten or carbon electrodes to 3/16-in. dia.


Regardless of Shape
Bunting manufactures Special Bearings to your blueprint. Cylindrical or flanged, tapered, slotted, milled, drilled, splined, broached, knurled, threaded, grooved—Bunting has the equipment to do it.
One great advantage of the sleeve bearing is that it can be adapted to your design. There are no arbitrary standards to impose the requirements of one industry upon another.
Bunting engineers have experience and valuable knowledge to help you in designing the bearing to meet your conditions.
The Bunting Brass & Bronze Company, Toledo 9, Ohio.
Branches in Principal Cities.
PRECISION BRONZE BARS
BRONZE BEARINGS
BUSHINGS
Bunting



High-Frequency Induction Heater For Surface Hardening, Brazing

A 2-kw. bench-model high-frequency induction heater for surface hardening, brazing, soldering, annealing and other heat-treating operations is introduced by Scientific Electric Div., "S" Corrugated Quenched Gap Co., 107 Monroe St., Garfield, N. J.

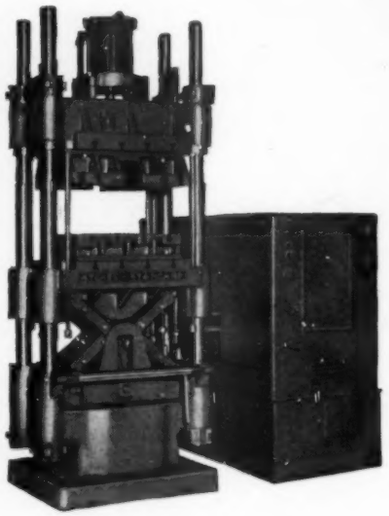
Unit operates from 110-v. line and is available with footswitch and one heating coil made to customer's requirements. Work coil is ½- to 2½-in. dia. Unit will operate with coil of one to a maximum of 20 turns.

Hobart ac. Welding Equipment Joins Magnesium Alloys, Steels

An ac. welder, designed for use with Heliarc equipment as supplied by The Linde Air Products Co., uses helium or argon for inert-gas-shielded welding. It is made by The Hobart Brothers Co., Hobart Square, Troy, Ohio.

The equipment can be used for welding magnesium alloys, aluminum, high-carbon and other alloy steels, brass and other metals. Known as Model TIH-300-s, the welder embodies high-frequency stabilization. A window is provided through which the spark gap may be observed, with a door through which it can be reached for adjustment.

Pressing the pedal starts the arc and opens valves at the same time, permitting shielding gas and cooling water to flow through the torch. When the pedal is released the arc is broken but the gas and water continue flowing up to 180 sec. This delay protects weld metal from oxidation until it has time to solidify.

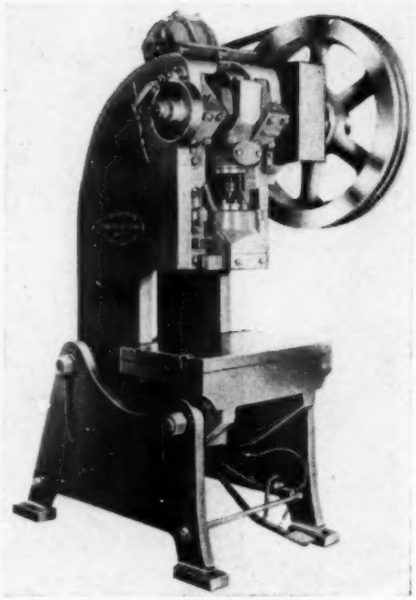


Stokes 150-Ton Plunger Press Has Optional Loading Methods

A 150-ton plunger press is offered by F. J. Stokes Machine Co., Philadelphia 20, Pa. The press utilizes "Standard" toggle action to lock the mold shut. The plunger cylinder is mounted on the head of the press and a single motor provides power to two pumping units for actuating the toggle lock and applying ram pressure respectively.

The method of loading the press is optional. A preform can be placed in a centering ring of the lower die when open. In the alternate method the die is closed empty and a preform, or powder charge, is loaded through the top of the die between the upper bolsters.

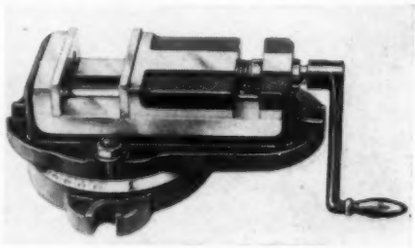
The controller trips a series of switches which in turn times each press movement. It permits manual as well as semi-automatic operation. When exact cycle has been established for any job the controller permits the mechanism to be locked to eliminate tampering. A 50-ton model is also available.



Superior's Welded Punch Press Employs Self-Energizing Brake

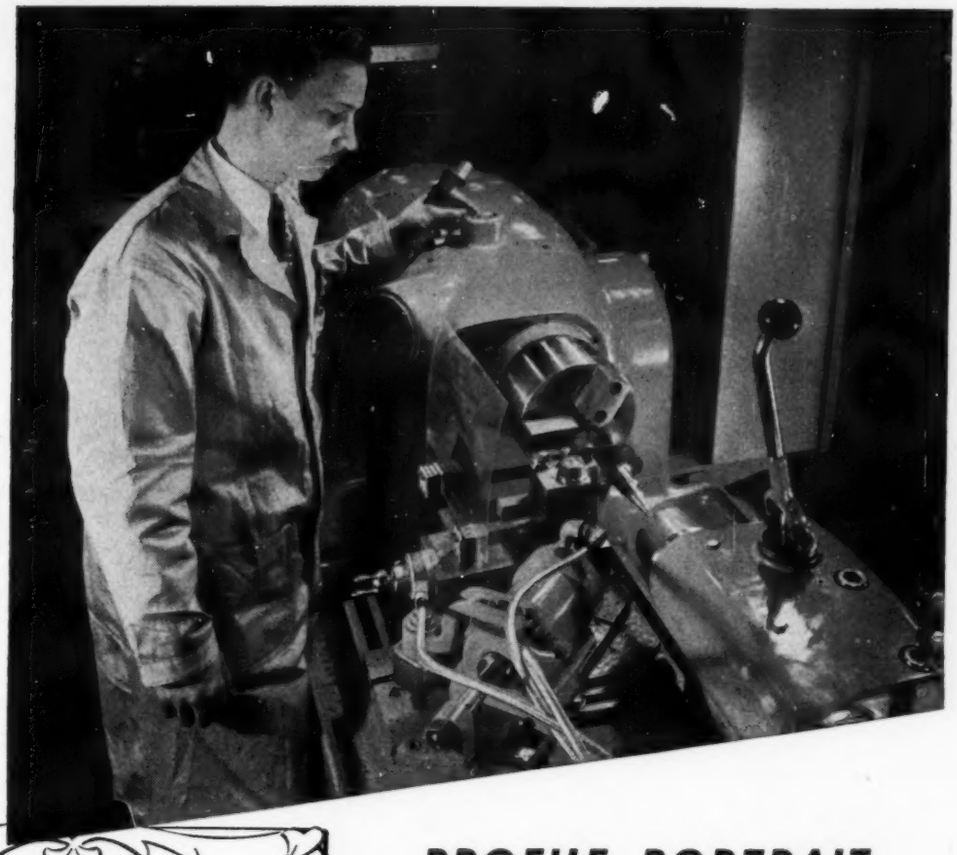
The Superior Punch Press Co., 3610 Superior Ave., Cleveland, Ohio, announces a welded-steel punch press in 70- and 100-ton capacity. Main feature is a self-energizing brake which is applied at moment of clutch disengagement only. Braking increases in pressure until the crankshaft reaches zero speed. The synchronized brake and clutch action is said to eliminate brake drag. This feature would save horsepower and increase life of brake lining.

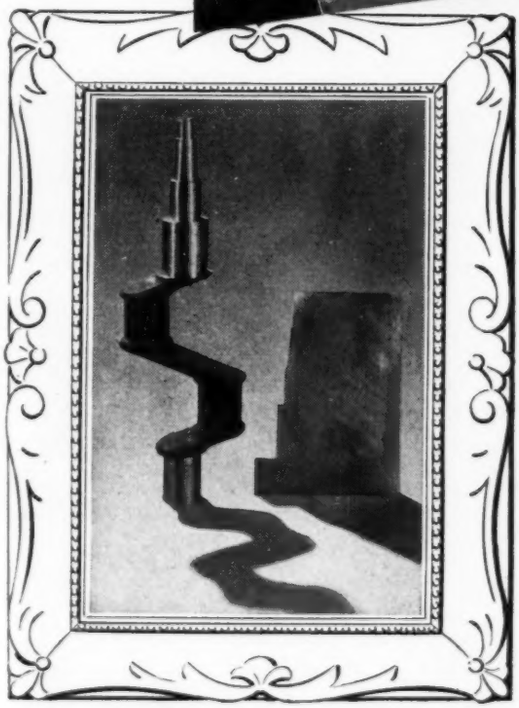
Clutch is cam controlled and is mounted on the crankshaft which works the throwout yokes. The 70-ton press has standard stroke of 3½ in. and a bolster-plate of 22x32 in.



L-W's 3-in. Swivel-Base Vise Suitable for Milling Machines

A 3-in. swivel-base vise suitable for milling machines, shapers, grinders and drillpresses is made by L-W Chuck Company, 25 South St. Clair St., Toledo, Ohio. Vise has a graduated base and can be used plain or swivel. The jaws are 3 in. wide and 1 in. deep. Four bolt and key slots are provided to attach vise to machine table. Weight of vise and crank is 16 lb.





PROFILE PORTRAIT OF PRODUCTION

Floor-to-Floor Time—24 Seconds!

(Former Machining Time, on Multiple Tool Automatic—40 Seconds)

Here's a 10¾" compressor crankshaft machined within limits of .0005" maximum error on all diameters—as proved on a 2,000 lot run.

That's the Monarch way to "*peak production at a profit*".

The machine that makes this outstanding record is a 2,000 rpm Monarch Uni-Matic, equipped with the new Air-Gage-Tracer Uni-Mat—just announced at the Machine Tool Show.

With this Uni-Matic you'll get not only greater accuracy and increased production—you'll get finished parts at a fraction of the former tool cost—and with substantially less down time.

On this job, tool change, necessary only after 350-400 pieces, requires less than one minute.

All surfaces of the crankshaft are machined by a continuous, single tool cut. A chamfer, multiple diameters, a taper, radii and shoulders—all are Air-Gage-Traced from the master template on a fully automatic machining cycle. The operator merely loads, presses the starter button, and unloads when the cycle is complete.

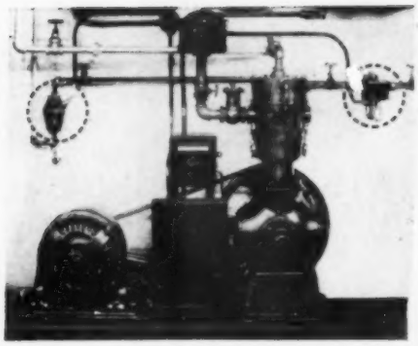
May we show you how the Monarch Turning Machines can cut costs in your shop?

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

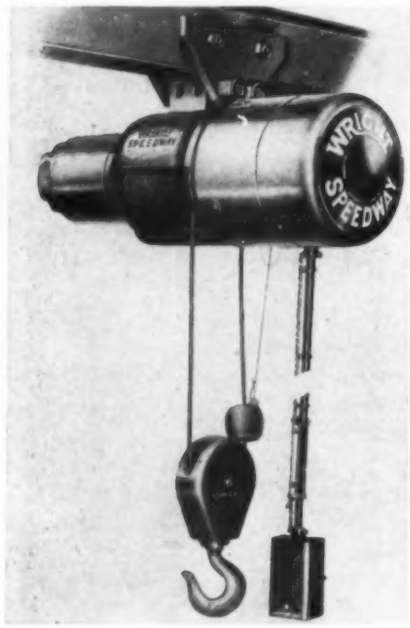
THE MONARCH MACHINE TOOL CO., Sidney, Ohio

FOR A GOOD TURN *FASTER* —— TURN TO MONARCH



Direct-Operated Solenoid Valve Utilized in Compressor Control

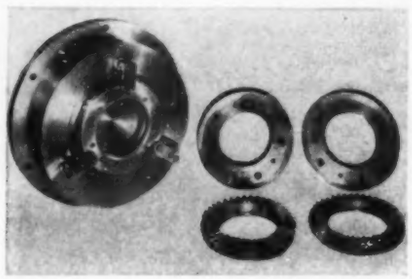
A direct-operated solenoid valve has been added to the compressor control made by Johnson Corp., Three Rivers, Mich. It provides automatic control of the water supply to water-cooled compressors, protects against overheating, and is said to provide considerable water savings. Unit handles temperatures to 400 F. and, in some sizes, will operate under differential pressures to 150 lb. Electrode holder is shown mounted in discharge at left, solenoid valve at right.



Wright Speedway Electric Hoist Accommodates Full 12-Ft. Lift

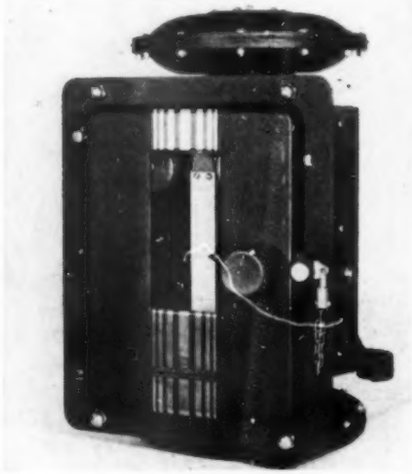
A line of Speedway electric hoists has been developed by Wright Hoist Div., American Chain and Cable Co., Inc., York, Pa. Built in capacities of 250 to 2000 lb., the hoist incorporates a grooved drum which is said to accommodate a full 12-ft. lift with no overwinding.

Other features include: pushbutton control; preformed wire rope with swaged fittings for anchoring; and tapered roller-bearing trolleys. Unit is furnished with lug, hook or trolley suspension. Hoists furnished with trolleys are equipped with special pull chain and handle for moving hoist along runway beams.

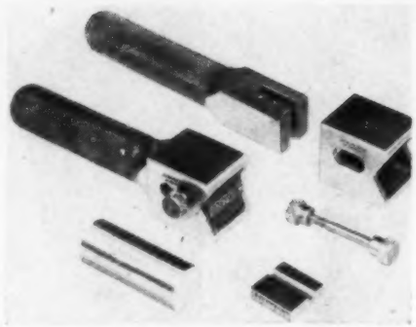


Garrison Draw-Bar Type Chuck Will Handle Different Gears

A draw-bar type gear chuck with interchangeable locating rings for handling different gears is announced by Garrison Machine Works, Inc., 515-525 Bannock St., Dayton 4, Ohio. The chuck is used for locating bevel gears by the pitch line of the teeth while grinding the bore and a portion of the back face at one chucking. Although draw-bar operated, it is adaptable to different machines, without using a threaded connector, as the mechanism is not connected directly to the draw-bar. Various sizes are available.



AIR-FUEL RATIO controller employs electric-motored valve drives and needs no hydraulic piping. Made by Leeds & Northrup Co., 4938 Stenton Ave., Philadelphia 44, Pa. A balance-type unit, its ratio can be adjusted manually. As fuel flow changes, instrument can maintain constant air-flow ratio or can provide automatic variation of ratio



New Method Self-Aligning Stamp Marks Solid, Round, Bar Stock

A semi-universal self-centering and self-aligning holder for marking various sizes of solid round bar stock with part numbers and other data has been developed by New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich.

The marker consists of holder, floating V-block guide, clamping pin, and either individual type or logotype engraved with required lettering. The V-block guide slips over holder and marking die, and slides up and down, automatically centering and aligning stamp on bar.

Sequential Sampling Calculator Based on Quality Control Factors

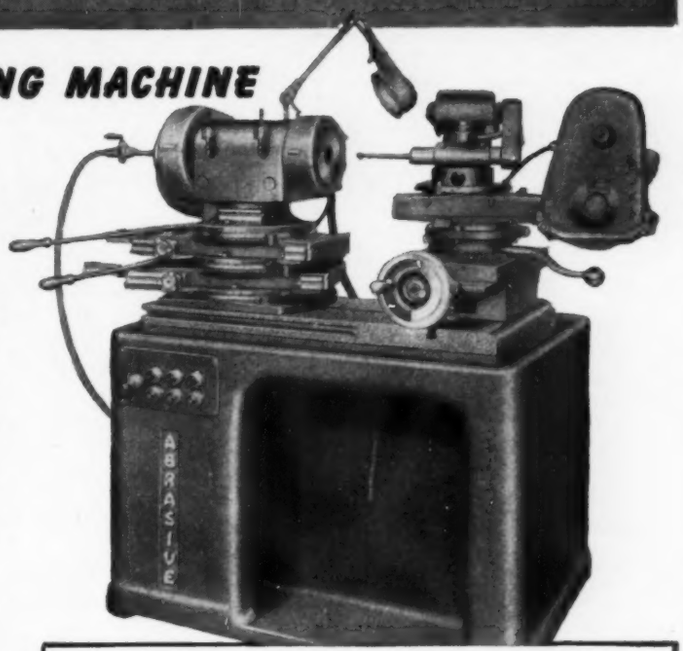
A pocket-size calculator for sequential sampling has been announced by Lightening Calculator Co. Inc., 496 Atlantic Ave., Brooklyn 17, N. Y. It can be calibrated to fit existing standards, or a sequential sampling program can be developed by consultation with a quality-control statistician.

The calculator indicates how many samples to take, how long to continue sampling, and whether the lot should be accepted or rejected. It functions on the basic factors of quality control, including quality levels and risks.

FEATURED AT THE MACHINE TOOL SHOW

ABRASIVE No. 5AWF INTERNAL FINISHER

A NEW CARBIDE FINISHING MACHINE



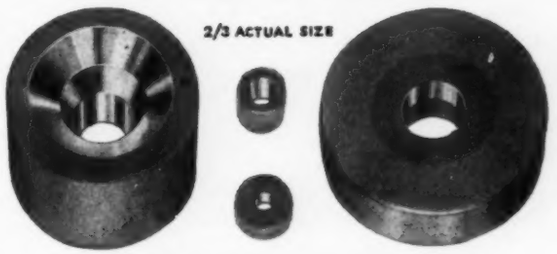
THE increasing use of carbides and similar materials for dies, gages, bushings, etc., has created an urgent need for an accurate machine to grind and finish such materials rapidly. The ABRASIVE MACHINE TOOL COMPANY, long an outstanding manufacturer of precision surface grinding machines, now presents the No. 5 AWF INTERNAL FINISHER, manufactured and sold under the Walter G. Wessman patents. This accurate machine, quickly set up for internal or external work, is capable of grinding and micro-finishing at one chucking several angles or combinations of straight and angular surfaces. The grinding action differs from previous methods in that both straight and angular surfaces are ground with a wide section of the wheel, utilizing a grinding action "across the work surface".

The finishing of carbides heretofore has been slow and hazardous due to the uncertain action of the grinding wheel. Now ABRASIVE makes available a patented reciprocating feature built into the wheel slide which causes the "hills" between the "valleys" to be eliminated, giving a much smoother finish and faster production. The increase in cutting speed is due to the tendency of the grains, under reciprocation, to wear thin and stay sharp, so they actually cut the material instead of rubbing it away.

RECIPROCATING SLIDE

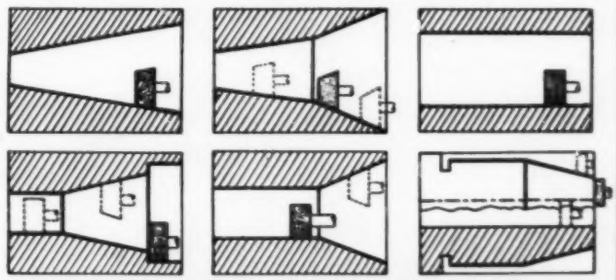
The ABRASIVE No. 5 AWF INTERNAL FINISHER grinds carbides to extremely high finish and permits a rapid stock removal as well. In an early test made on a ½" diameter carbide die ½" thick, a semi-skilled operator was able to remove .025" of stock from the hole in 60 seconds without leaving any chatter or "bell mouth" condition.

One of the outstanding features of the machine that makes this unusual speed and accuracy possible is the patented reciprocating wheel slide motion. The reciprocating action of the wheel puts more of the grains of the abrasive to work and prevents gouging by the wheel. Both the speed and the length of reciprocation are adjustable for maximum efficiency. An interesting demonstration can be accomplished by grinding a carbide hole with the reciprocator operating, noting the stock removal, finish obtained, and size control. Then shut off the reciprocator and attempt to duplicate the same operation. The work produced will be quite inferior and the time element greatly increased.



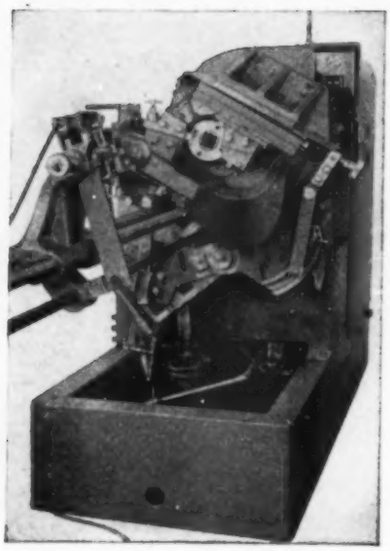
MULTIPLE ANGLE GRINDING ACCOMPLISHED IN ONE SET UP

These pieces were ground without form wheels, cams or templates. The unusual cutting action provided by the fast reciprocating wheel slide produces a microinch smoothness of 2 RMS or better without lapping, honing, or polishing.
The sketches show typical grinding operations performed at one setting of the ABRASIVE No. 5 AWF INTERNAL FINISHER.



ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND, U. S. A.

ABRASIVE
ACCURACY BOOSTS PRODUCTION



Modern Cutting-Off Machine Features Automatic Cycle

An automatic cutting-off machine for cutting tubing, pipe or solid bar stock has been introduced by Modern Machine Tool Co., Jackson, Mich. It uses the same cycle as the manually-operated machine manufactured by the company and is similar in design. The cross-slides are set at an angle for better chip clearance.

The double live-roll stock feed will feed any length of stock through the spindle. As stock strikes a trip plate on the stop, an automatic cycle is started, taking about 1½ sec. plus cutting time.

Nickel Silver 828 Welding Rod Welds Steel, Cast-Iron Joints

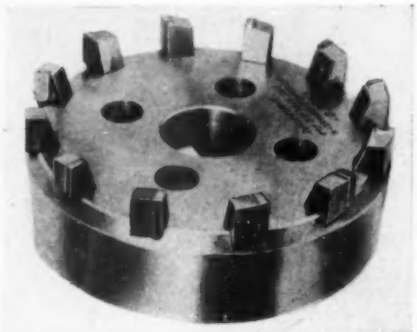
Anaconda Nickel Silver 828 welding rod for oxy-acetylene white-bronze welding of steel and cast iron is announced by The American Brass Co., Waterbury 88, Conn. The melting point is approximately 1690 F. and the rod is said to flow freely with little fuming. Used only with oxy-acetylene welding or brazing technique, it is not suitable for arc-welding methods. Rods are available in sizes ⅛ in. and larger.

Fusion Series of Super Solders Developed for Brazing, Soldering

A series of Super Solders in paste form has been announced by Fusion Engineering, 1836 Euclid Ave., Cleveland 15, Ohio. The underlying theory of the series is that a "micro-film" of solder will develop the greatest strength per unit of weight.

These chemical paste alloys contain the flux, cleaner, tinning agent and actual metallic solder complete. The paste can be applied automatically or by hand before soldering.

The series covers three temperature ranges: low-temperature alloys, 200 to 500 F.; medium-temperature alloys, 500 to 750 F.; and brazing alloys, 1150 to 2000 F. They are also separately compounded for each type of application or material such as electrical, sweated fittings, sheet metal, stainless steel, nickel-chrome alloys and others.



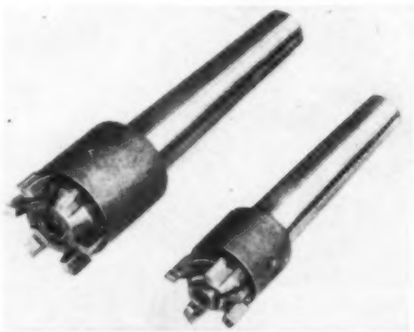
Face mills have ten to twenty blades

Howald Carbide Milling Cutters Include Shell, Face, End Mills

A line of carbide milling cutters is marketed by H. T. Howald Machine Works, 182 Sigourney St., Brooklyn 31, N. Y. The "Sharp-Blade Lock" on shell and face mills and the "Cone-Blade Lock" on the replaceable-blade end mills provide a means for replacing and making blade adjustments for setting and grinding.

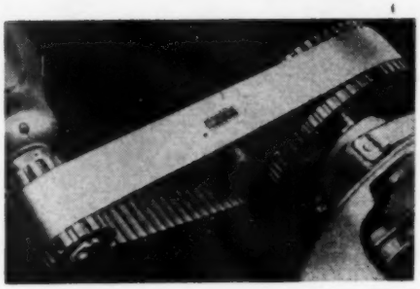
The blades are of standard square stock without serrations, grooves or other limiting elements. Blades therefore can be ground to any combination of angles.

Replaceable-blade end mills are



End mills have four to six blades

suited for small milling jobs, and are made from 1½- to 3-in. dia. Shell mills for light or heavy duty range from 3- to 6-in. dia. with six to twelve blades. Face mills for heavy duty are 8⅜-in. to 14-in. dia.



U. S. Rubber Gilmer Timing Belt Features Non-Slip Rubber Teeth

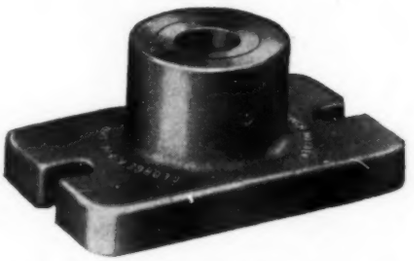
A belt with rubber teeth that will not slip is announced by G. H. Gilmer Div., United States Rubber Co., Rockefeller Center, N. Y. It is designed for use on machinery equipped with special pulleys grooved to fit the teeth.

The belt is reinforced with steel cables embedded in oil-resisting synthetic rubber, and makes positive engagement with the pulleys at any speed to 10,000 fpm. The cables are said to reduce stretch to almost zero.

Listed as the Gilmer Timing belt, the device is made in various sizes to meet machine-designer requirements. It is suitable for power transmission and synchronization.

Fel-Pro Hi-Temp Thread Compound Prevents Freezing Metal Surfaces

Felt Products Mfg. Co., 1504 Carroll Ave., Chicago 7, Ill., announces C-5 Hi-Temp thread compound, said to prevent freezing and galling of metal surfaces at temperatures as high as 1800 F. The compound was developed for high-temperature and high-pressure applications, such as furnace tube-header studs and plugs.



MASTER SHANK HOLDER is fastened to machine tables, faceplates or larger plates. It holds: punch-, die- and toolholders; shanks, adapters and shanked tools. Body is grey-iron casting. Top of boss, hole and bottom of base are machined parallel. Setscrew in side of boss holds work in place. Bushing has 1¼-, 1½- or 1 9/16-in. I.D. Overall height is 3½ in. Made by George F. Bub and Son, 1143 Madison Ave., Cleveland 2, Ohio

For Uniform High Quality no matter what the job . . . Demand

REEVES ARMY TWILL

Look for this Label in Your Uniforms, Utility and Work Clothes!

WHATEVER your industry, it is good business to specify uniforms and work clothes of durable, smart looking Reeves Army Twill. Its high tensile strength insures rugged wearability. It tailors smartly, too, and is color-fast to sun, water and perspiration. Sanforized Shrunk*, it is the fabric for long-lasting economy. Remember—over 90 million yards of this same fabric helped equip America's fighting men—exceeding Government specifications under the toughest climatic and combat conditions.

**Residual shrinkage less than 1%.*

THE REEVES FABRIC GROUP INCLUDES:

Reeves Army Twill • Reeveking Gabardine
Glengarrie Poplin • Marine Herringbone
Byrd Cloth • Warrior Twill • Mountain Cloth
Pima King Broadcloth • Reevecord

MADE OF FINE COTTONS

SPINNING WEAVING DYEING FINISHING Reeves FABRICS

REEVES BROTHERS, INC.

54 WORTH STREET, NEW YORK 13, N. Y.

"FROM COTTON TO CUTTER"

REPRESENTATIVES IN: *Akron • Atlanta • Boston • Chicago • Dallas • Los Angeles • Philadelphia • Portland, Ore. • St. Louis • Montreal • Toronto*

Parts and Materials

Ruthman's Model 11029 Pump Equipped with Upper-End Bell

A pump, Model 11029, has been introduced by The Ruthman Machinery Co., Cincinnati 2, Ohio. The pump motor, totally enclosed, is equipped with an upper-end bell that has a built-in conduit box with capacity to accommodate the multiple lead wires of dual-voltage stators. Sealed prelubricated ball bearings are used.

Twin inlets within the pump are arranged to provide hydrodynamic balance and are said to eliminate end thrust on the shaft. All rotating parts are dynamically balanced by an electronic process.

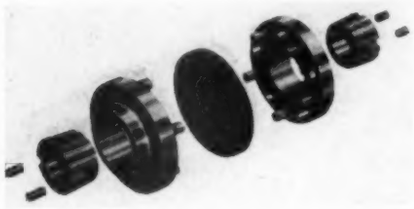
Capacity at 26-ft. head is 40 gpm with ½-hp. motor, and 60 gpm. with ¾-hp. motor. Unit can handle liquids containing grit and abrasives, as there are no metal-to-metal contacts within submerged part.

GE Magnet-Holding Assemblies Made in Five Types, 17 Sizes

Metallurgy Div., Chemical Dept., General Electric, Pittsfield, Mass., announces a line of Alnico permament-magnet-holding assemblies. It consists of five types in 17 sizes ranging from a pull of 1½ to 500 lb.

The assemblies are vacuum impregnated to prevent moisture penetration, and are cadmium plated to prevent external corrosion. It is said that stray magnetic fields will not affect them.

The line features both "Close Flux" and "Deep Flux" types of assemblies. The former is available in "Cup," "Cup-Stem" and "Horseshoe" types, which are designed for applications in which required holding force is through a zero air gap and an extended magnetic field is not needed. The "Deep Flux" type is produced in "Magnetic Retriever" and "Magnetic Stand" models, which possess a magnetic field extending to a much greater depth than the "Close Flux" type.

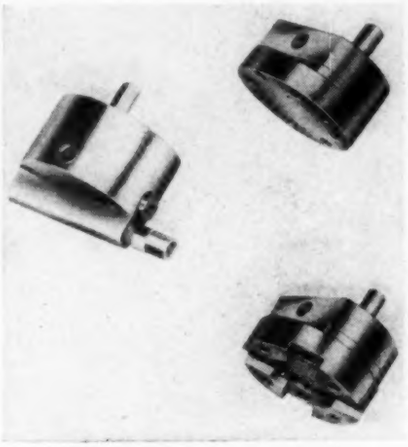


PIN-TYPE FLEXIBLE coupling incorporating the Taper-Lock bushing used with V-belt sheaves has been announced by Dodge Mfg. Corp., Mishawaka, Ind. Bushing is said to fasten to shaft with firmness of shrunk-on fit, and to make reboring unnecessary. Center disk is of oak-tanned sole leather, and can be removed by loosening coupling flanges and sliding them apart on shafts

Hardy Stainless-Steel Paste Protects Against Acid Action

An 18-8 stainless-steel paste for corrosion-resistant surfaces has been announced by Charles Hardy, Inc., 420 Lexington Ave., New York 17, N. Y. It is said to be useful where protection against action of acid or salt cannot be handled with ordinary protective coatings.

Paste contains approximately 11% Varsol as a solvent, and approximately 2% stearic acid. It is said to possess excellent leafing characteristics with most vehicles. Almost any clear lacquer, varnish or bronzing fluid can be employed as a vehicle. The thinner and the more transparent the vehicle, the brighter the silvery finish. Coatings can be applied by either brush or spray. Paste is available in 4-, 25- and 100-lb. cans.



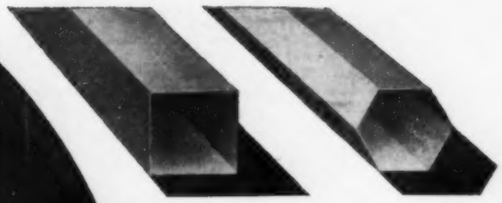
Bijur Small-Capacity Gear Pump In Three Constant-Feed Types

A small-capacity constant-feed gear pump is introduced by Bijur Lubricating Corp., Long Island City 1, N. Y. The unit provides 50 cc. per min. at 100 rpm. Diameter of base is 2½ in.

Three types are available. The universal (upper right), can be mounted in any position, and direction of drive-shaft rotation determines direction of flow. The reversible (left center), maintains flow in one direction only, regardless of change of drive-shaft rotation during operation. The sump type (lower right), is equipped with an integral fine-mesh screen and can be mounted on sump directly.

Amercoat No. 40 Plastic Coating Adheres to Rubber, Canvas, Metal

A plastic coating developed for use on rubber, rubber belting and cotton belting has been introduced by Amercoat Div., American Pipe and Construction Co., P. O. Box 3428, Terminal Annex, Los Angeles 54, Calif. Called Amercoat No. 40, it is said to combine the properties of synthetic rubber with the chemical resistance of Vinyl resins and to produce a tough, flexible, water-



Forming a 6-inch diameter cylinder on a Cleveland Steelweld Press. Machines can be furnished for forming cylinders in lengths up to 20 feet.

SMALL DIAMETER CYLINDERS QUICKLY PRODUCED

Small diameter cylinders, square and hexagon tubing and other closed shapes are easily made with simple dies on Cleveland Steelweld Presses. Special steel dies are usually used for large quantities, but for small numbers a steel male die and a female pressure pad made of rubber is often used.

A series of successive bends are made starting at the ends of the sheet and finishing with the center bend. The dies are so made that the cylinder or tube when removed from the machine will spring to a closed position.

This is only one of the dozens of different jobs that can be done on any Cleveland Steelweld.

GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

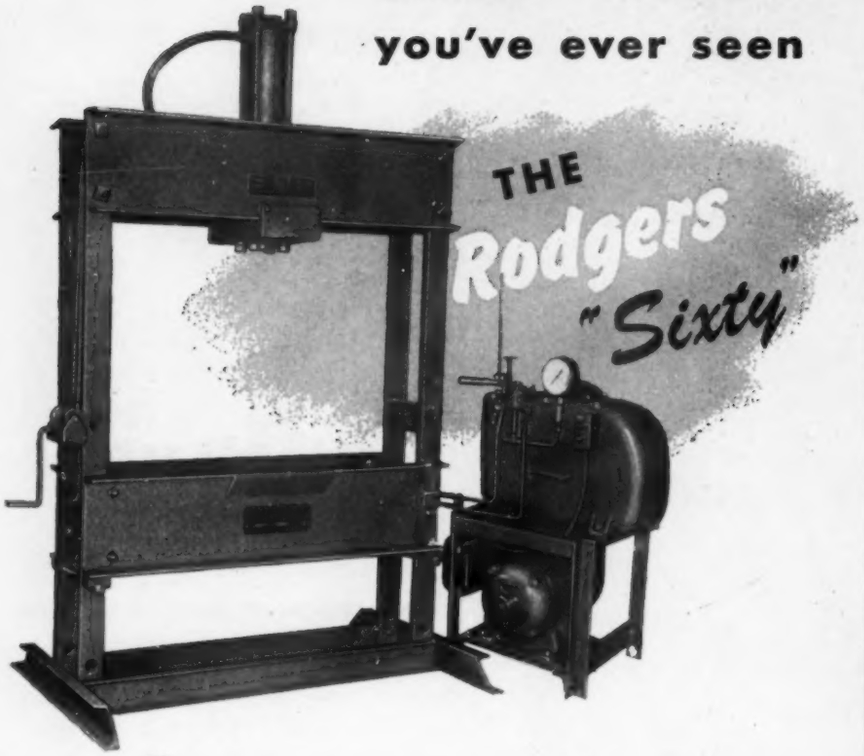
1416 EAST 281st STREET · WICKLIFFE, OHIO

STEELWELD

BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

The most *Versatile, Practical* SHOP PRESS you've ever seen



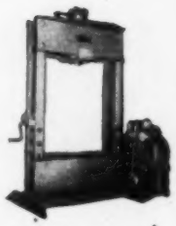
BEHIND the label—Rodgers "Sixty" 60 Ton Shop Press with power driven hydraulic pump—is a flexible, highly efficient production unit that will prove invaluable in taking care of those many miscellaneous time and labor consuming jobs. Powered with the Rodgers "D" pump and newly-designed four-way valve, it has all of the desirable features of a streamlined press for general shop use where pressures up to sixty tons are required.

Outstanding features include: An 8" opening between columns permitting long work to be slid through either end of press without obstruction; ram and cylinder may be moved into various positions on the press without changing placement of work; bottom bolster can be raised or lowered easily with a hand crank; and V-blocks for innumerable uses in any position on the bolster. Power pumps are available with or without four-way valve—and in manual or solenoid control.

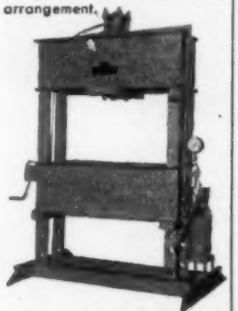
The "Sixty" is but one of the Rodgers series. Standard shop presses are available in 100, 150 and 200 ton sizes, with 300 and 400 tons capacity presses made to order. All include the same proved Rodgers design and performance features. All are rugged, durable, flexible and versatile.

There is a Rodgers Shop Press exactly suited to your needs in any tough service and maintenance work in pressing, squeezing and forcing. Prompt delivery on standard models.

Send today for your copy of the "Rodgers Hydraulic Shop Presses" catalog. It gives complete descriptions, illustrations and specifications of the various models.



Rodgers 150 ton Stationary Shop Press with hydraulic "D" pump and four-way valve arrangement.



Rodgers 100 ton Stationary Shop Press with 4-speed, hand-operated hydraulic pump.

Rodgers Hydraulic, Inc.

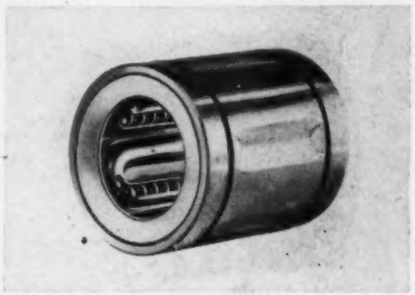
HYDRAULIC POWER EQUIPMENT

Shop Presses · Crawler-Track Presses · Portable Presses · Power Pump Units

7407 Walker St., St. Louis Park, Minneapolis 16, Minn.

resistant film. It will adhere to rubber, canvas, metal, concrete and wood after surface has been properly prepared. It is recommended for conveyors and belting subject to abrasion, spillage of water, grease, oil and other chemical solutions.

Coating is available in two grades, No. 40 and 40X. The former provides a harder, tougher film, while the latter provides a film similar to soft rubber. Both are non-toxic and non-contaminating.



Thomson Linear Ball Bearings Featured for Unlimited Travel

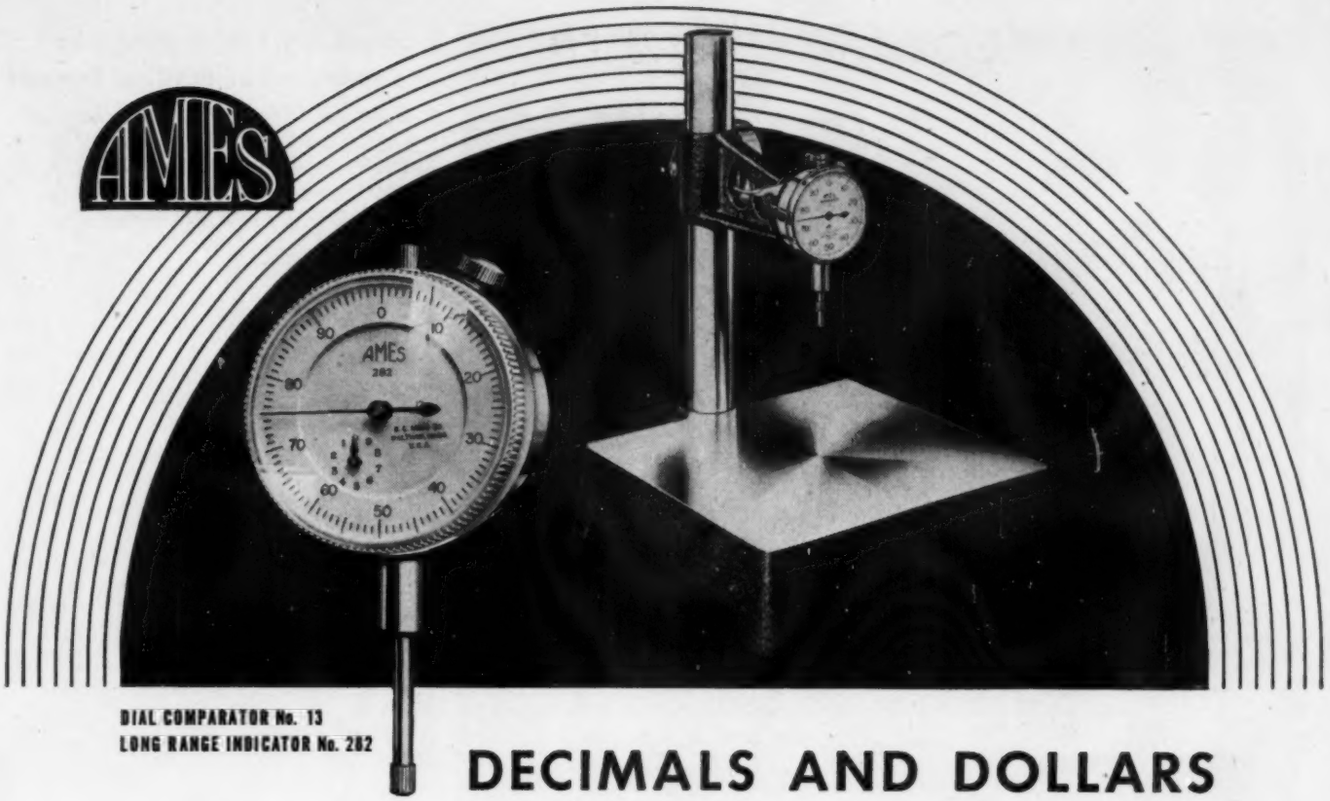
An unlimited-travel anti-friction ball bearing for linear or reciprocating motion has been developed by Thomson Industries, Inc., 1029 Plandome Rd., Manhasset, N. Y. Called "Series A" ball bushings, the bearings are self-contained units each with three basic parts in addition to the balls: a sleeve; a pressed-steel retainer fabricated in long continuous strips, cut off and rolled up to fit inside the sleeve; a pair of rings which are pressed in the sleeve ends to position and secure retainer.

Bushings are available for shafts having ¼-, ½-, ¾- and 1-in. dia. Lubrication problems of plain sliding members are eliminated as the bushings do not depend on the maintenance of an oil film over an exposed surface. The bearing is said to have a low friction coefficient.

New Hampshire Small Steel Balls Held to ± 0.00005-in. Tolerance

A line of extra-small precision-grade steel balls have been added to the group of Micro ball bearings produced by New Hampshire Ball Bearings, Inc., 1 Granite St., Peterborough 1, N. H.

Made in 1-mm. (0.0394 in.) and 3/64-in. (0.0469 in.) dia., these high-carbon chrome-alloy balls are held to a size tolerance of ±0.00005 in. Said to be superfinished to a surface within 20 millionths of a perfect sphere, they are applicable for anti-friction bearings, ball-pens, instruments, and chemical processes.



DIAL COMPARATOR No. 13
LONG RANGE INDICATOR No. 282

DECIMALS AND DOLLARS

When you want to measure those decimals with maximum dollar savings, do it with an AMES DIAL COMPARATOR such as Model No. 13 shown above. Quickly and easily set to the required dimension. Maintains its setting even with rough usage. Gives instant, *accurate* readings — independent of the human factor. You'll find no other Comparator gives you such high production while saving so much in time and labor.

The 8″-square cast-iron base may be fitted with V-blocks, anvils, or stops of various kinds. The indicator-holding bracket extends 4″ over the base and is easily adjustable on the 9″ column. Measuring capacity is 6″. Net weight 16 lbs.

The indicator shown is one of a complete line of AMES Long Range Indicators from which you may select exactly the graduations, range, and dial reading best suited to your needs.

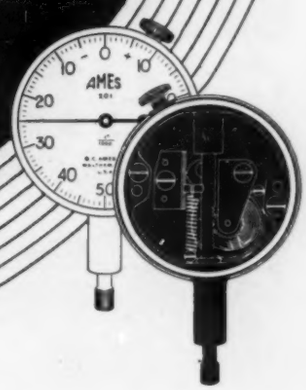
For information on our full line of Comparators and many other measuring instruments, address our Home Office:

26 Ames Street, Waltham 54, Mass.

B. C. AMES CO.

Mfr. of Micrometer Dial Gauges
Micrometer Dial Indicators

Representatives in principal cities



CLARK

"CLARK TRUCTRACTOR *Stole the Show!*"

That was the consensus of visitors to the First National Materials Handling Exposition.

You can count on Clark Tructractor to "steal the show" again at the second Exposition in Cleveland, January 12 through 16, 1948, with a display of sound and practical new handling ideas: Fork-Lift Trucks, Towing Tractors and attachments — products incorporating Clark's traditional quality and unrivaled experience.

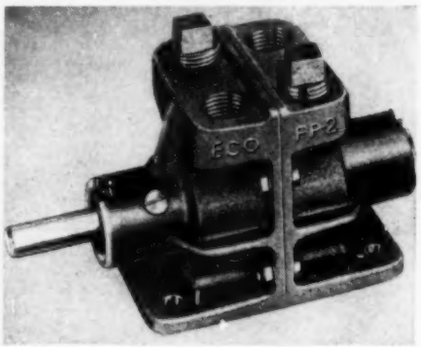
If movement of materials enters into any phase of your operations, a visit to Clark's exhibit is a MUST. Booths—407-8-9 and 419-20-21.

CLARK GAS OR ELECTRIC POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

CLARK EQUIPMENT COMPANY, TRUCTRACTOR DIVISION, BATTLE CREEK, MICHIGAN
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

Scovill Mfg. Cold-Heading Wire Comes in Two Principal Tempers

Scovill Mfg. Co., Waterbury 91, Conn., announces extruded cold-heading wire available in two principal tempers to satisfy requirements for fabricating brass rivets or screws by heading and extruding, or heading and drilling. The wire is produced by hot extrusion from Cartridge brass, 70%. Coils are available from 0.060- to 0.128-in. gage with I.D. approximately 12 or 14 in., and over 0.128-in. gage with I.D. approximately 12, 14, 15, or 16 in.



Eco Engineering Gearless Pumps Feature Double-Impeller Design

A line of gearless pumps has been developed by Eco Engineering Co., 12 New York Ave., Newark 1, N. J., featuring a double-impeller design which is said to give a strong flow against pressure. Special impellers can be provided to suit particular characteristics of liquid being handled.

Pumps are available in ¼- and ½-in. sizes, with capacities from 1 to 12 gpm. They can be used against pressures up to 50 psi., and will deliver at speeds from 200 to 3500 rpm.

Potter Model 450 Interval Timer Registers Intervals to 1 Sec.

Model 450 interval timer for applications which require extremely accurate time-interval measurement is manufactured by Potter Instrument Co., Inc., 136-56 Roosevelt Ave., Flushing, N. Y. The instrument will measure intervals in steps of 0.625 microsecond and will register, directly, intervals to 1 sec.

The timer is actuated by positive pulses which can be easily derived from detectors such as photoelectric equipment and closing contacts. The time base included in the instrument consists of a 1.6-megacycle crystal oscillator. Indication is by means of neon-indicator glow lamps.

Nicholson

sells only through Industrial Distributors and Hardware Wholesalers

Here's how this system benefits you as an industrial user

The distributor of industrial tools and supplies performs a very necessary function in the commercial economy of a nation whose industries are huge, varied and located over a vast area.

He is both a *gatherer* and a *distributor*.

He scours the earth for the things you need. He examines and studies them; weighs their merit and value; helps determine which brands will serve you best. Thus he becomes expert on selection, application and proper use. He stocks or warehouses countless items — and patiently awaits your pleasure as to *when* you may want *how much* of *what*.

He takes over sales, credit, delivery and other services which, if handled by the manufacturer himself, would increase the latter's supplying costs — and consequently your purchasing costs.

Yes, your industrial distributor does these and many more things in both your and the manufacturer's behalf which it would be uneconomical for either to do independently.

The more support he gets — from both manufacturer and user — the more useful he becomes to all concerned. Nicholson believes firmly in this policy.

NICHOLSON U.S.A.

NICHOLSON FILE CO. • 29 ACORN ST., PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)

NICHOLSON FILES for every purpose

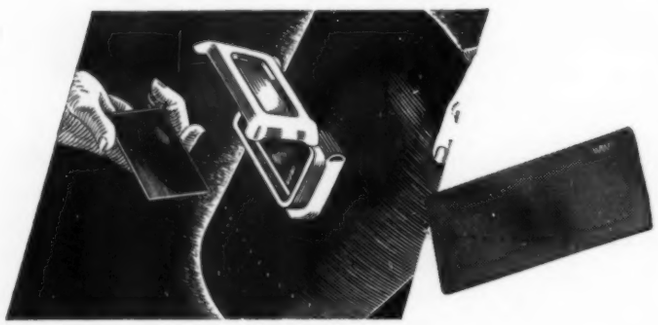
under "Arc lights" ...think of WILLSON

Style No. 130

A LITTLE MONEY GOES A LONG WAY . . . to give dependable protection to face and eyes in this ruggedly built, low cost helmet. Willson-Weld glass in non-corrosive metal holder.

Style No. 605

GIVE WELDERS' EYES A LIFT . . . Flip-front on this one piece helmet allows quick, easy inspection and is convenient for working in close quarters. Willson-Weld Glass in hinged portion.



WW THE MARK OF MEASURED PROTECTION . . . The Willson-Weld* trade-mark on welding glass is your assurance of accurate grading for density of shade and thickness to meet or exceed government specifications.

For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest Willson distributor or write us direct.

*Reg. U. S. Pat. Off.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED

READING, PA., U.S.A. Established 1870

235 WASHINGTON STREET, READING, PA., U. S. A.

Adjustable Anode Rods Featured For Still Plating-Tank Equipment

An adjustable anode rod for use in alkaline solutions and chrome baths has been announced by Hanson-Van Winkle-Munning Co., Matawan, N. J. The rod, used for plating of irregularly shaped parts in still plating tanks, consists of brackets welded or bolted to the tank wall to which insulated steel plates or arms are pivotally attached. The anode rod is supported at the outer end of these arms and can support several hundred pounds of anode material. Current is supplied by a flexible cable attached to one end of the rod, while a handle at the other end permits adjustment.

ROUND TABLE Discussion

WHOSE JOB IS METHODS IMPROVEMENT?

Methods improvement is the responsibility of all productive labor, as well as of management. Basically every improvement that is made means extra pay in each employee's envelope since it allows the company to produce at a lower cost, thus meeting the competition of today.

Foremen are responsible for methods improvement. They are the first line of management and are closely related to the work being done. The worker is also responsible for the developing and passing on of new ideas for improving production methods.

Today the foreman does not have sufficient time to carry out the methods work to the fullest extent. He is busy trying to keep all the jobs rolling in his particular department and in taking care of union problems. He does have, however, ideas of how the work could be accomplished more efficiently, but not the time to develop the ideas into reality.

From this need for coordination has been established the methods department. The men in this department are selected for their diversified knowledge of how jobs are done in other plants. They are able to obtain a better over-all picture of the company's problems since they are staff members and do not have the worry of getting an order out on schedule.

Methods men realize that foremen

Look to MODERN for accurate, fast, economical thread cutting

Hardened and ground throughout

Wider threading range

Made with least number of parts

Cut close-to-shoulder threads without special chasers

Easily adjusted for thread size

Greater flexibility

Quick and easy chaser change

MODERN

STATIONARY TYPE SELF-OPENING

DIE HEADS

Modern Precision Tools Include . . . . .

- STATIONARY SELF-OPENING DIE HEADS
- ROTARY SELF-OPENING DIE HEADS
- STATIONARY COLLAPSIBLE TAPS
- ROTARY COLLAPSIBLE TAPS
- MODERN-MAGIC CHUCKS AND COLLETS
- SELF-OPENING STUD SETTERS
- INSERTED BLADE FACE MILLING CUTTERS
- SOLID ADJUSTABLE DIE HEADS
- ADJUSTABLE HOLLOW MILLING TOOLS
- UNIVERSAL CHASER GRINDING FIXTURES

Modern Self-Opening Die Heads thread diameters from ⅛" to 7" in standard heads, and up to 14" in special heads . . . accurately, fast, and economically. They are adapted to practically every thread cutting operation within their capacity. Designed for use in hand screw machines, turret lathes, and other machines where the die heads are used in a stationary position.

For complete information, write for Bulletin No. M-123

MODERN TOOL WORKS

DIVISION OF

CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

YOUR GEAR DEPARTMENT

Completely Tooled—Fully Manned!

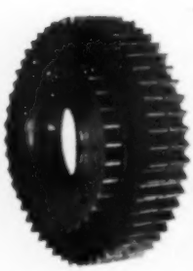
Before you make those recommendations for that new gear department — which you know will take twice as long as you plan and cost twice as much as you estimate, we invite you to consider the advantages offered by Amgears, Inc., Chicago — contract gear manufacturers.

Amgears is now in effect providing gear departments for many leading industrial firms — working with them as a closely integrated part of their own facilities.

Amgears manufactures a wide range of gear sizes, from fine pitch instrument gears to heavy industrial gears and gear assemblies — from gears of aircraft precision to those specifications which are less exacting.

If you were planning to make spurs, sprockets, helicals, worms and worm gears, racks, straight or spiral miter or bevel gears, AM*gears has a department for you — completely tooled and fully manned.

Write today for a copy of A CHECK LIST FOR THE GEAR BUYER — *no obligation.*



Amgears also manufactures a complete line of Amtec Gear Tools, including spline arbors, gear chucks, master gears and spline gauges.

AMGEARS, INC.
CHICAGO, ILLINOIS
A SUBSIDIARY OF
HUPP CORPORATION
CONTRACT MANUFACTURERS
DETROIT - CLEVELAND

6633 WEST 65th STREET
Telephone: Portsmouth 2100

*AM — Accurately Made.

and workers are their best sources for data and ideas. Credit is always given where it is due. That is one of the engineering codes that make it possible for a methods department to progress satisfactorily and gain needed cooperation.

Foremen that have worked with a properly organized methods department find this staff organization a big help to them. Many tough nuts have thus been cracked.

The wise foreman does not sell the methods department short, for it performs a function that the foreman alone cannot. The department will assist him to increase the quantity and improve the quality through a complete study of all phases entering into the manufacturing of the product.

Charles D. Townsend
Centralia, Mo.

•

It is everyone's job on the payroll to try to improve wherever possible the methods of manufacture of the product being produced.

During the last few years, special engineering methods departments have been set up in the majority of large plants. Prior to the introduction of these departments, most of the responsibility fell to the superintendent and foremen.

Ed doesn't believe that a methods department is necessary or desirable, but methods engineers operating from this department have come to stay, and they have been found to pay dividends.

This department supplements foremen's efforts by laying out all operations and the type and kind of material to be used, plus determining the necessary labor and machine hours to achieve the production goal.

The new department is of great help to the foreman as it leaves him free to give all of his time to the men and equipment he is responsible for. I don't think the foreman can handle method improvements under today's rush and complexity of operation and maintain production standards.

Times have changed and foremen have to work with many employees that are semi-skilled, thus taking up more of their time.

Generally speaking, foremen, while they have mechanical knowledge, have not the education, engineering training, technical knowledge and drawing ability that is absolutely necessary to a methods engineer.

Arthur Silvester
Niantic, Conn.

Another KENNAMETAL Development...

ONE KENNAMETAL Grade K6 Will do your Cast Iron Jobs

STRONG, HARD K6 SAVES TIME AND TOOLING COSTS ON BOTH JOBS

One versatile Kennametal grade—K6—has *all* the characteristics required for practically every cast iron machining job. It performs equally well on roughing, finishing, or precision boring.

★ *K6 has the strength to withstand the shock of machining tough, sandy, or chilled castings, even when they are out of round, or have surface interruptions.*

★ *K6 has high hardness to resist abrasion, and to hold its edge for long periods of cutting.*

These properties are uniformly maintained by distinctive manufacturing processes.

Extracts from typical performance reports:

★ *"K6 removes metal from chilled cast iron piston trunks at tool cost of 74c per ton."*

★ *"40 webbed flanges turned between grinds with K6, whereas one to four pieces was best peformance of carbide previously used."*

★ *"K6 turns out 11½ times as many pieces between grinds."*

★ *"With K6 we have tripled the feed, doubled the cutting speed, and are facing 8 times as many sandy iron castings."*

The best way to prove that K6 can reduce your tooling costs, and increase your production is to try it in your shop—then compare tool performance and overall costs. Ask your nearest field engineer to advise you.

KENNAMETAL
SUPERIOR CEMENTED CARBIDES
TRADE MARK REG. U. S. PAT. OFF.
KENNAMETAL Inc., LATROBE, PA.

THERE'S A KENNAMETAL TOOL with a K6 TIP FOR EVERY CAST IRON CUTTING JOB

STRONG, HARD K6 EXCELS ON INTERRUPTED CUTS

WORK THE RULES OR RULE THE WORKS?

Even as a country must have its laws so must a factory have rules—and these must be observed in each case. If in a plant all men, foremen as well as workmen, could be made to one pattern, then rules could be as rigid as those of mathematics and be applied as ruthlessly. But such standardization is not possible.

A works manager once decided that any one not arriving before the works gates were closed should not be admitted until the start of the next shift. A perfectly sound rule, theoretically. But many men had to travel, and there were delays due to fog, snow, frost, and sometimes to big sporting events, such as the Derby and Ascot races. Carrying out the rules became impractical because of causes outside the men's control. Similarly with applications for special leave. Refusal is often counteracted, if not anticipated, by a doctor's certificate for feigned illness, another form of "to attend grandmother's funeral."

The rules of a works are analogous to the laws of a country, and the existence of law courts and judges is the best answer to the question. Choose good foremen; give them general guidance, but trust them. If they cannot be trusted, replace them.

J. E. Powell
Glos., England

•

TROUBLE-MAKER OR TROUBLE-SHOOTER?

Some foremen assign a job and then proceed to go into profuse detail as to how the job is to be done. This would not be upsetting if it happened on occasion, with a job of a particular nature, but to have to listen to the same instructional line on every job is not sensible.

There is, however, the other extreme—the overly confident foreman who leaves too much to the judgment of his men. I have in mind one fellow who had a crew of men installing the structural-steel, concrete-embedded conduits upon which a large gantry crane was to travel. I followed the construction proceedings from day to day from my vantage point in the cage of my 20-ton crane. Whether it was for dramatic effect or not I do not know, but he would snatch a blueprint from the hand of one of his men, give it a brief glance before slamming it to the ground, then, with his coattail flapping in unison with his spirited steps, would bellow "Get the damn thing done . . ."

This little comedy turned into a heartbreaking tragedy when they rolled the colossal crane in and found that the track gage was a foot too short. While the men were slaving away with the drills and sledges as they strived to remove the hard concrete, Mr. Swallowtails was no longer in evidence. He had put too much trust in his men and, as a consequence was on the outside—looking for another job.

John Homewood
Ontario, Calif.

•

A foreman should find out as far as possible the mechanical knowledge, ability to use that knowledge, and the temperament of each of the workmen under him. Then he can deliver orders and special instructios that may be needed, omitting any special details that the individual already understands.

It is too much to expect from a foreman the last word on every job handled, but among the workmen there are likely to be some specialists on various machines or in certain lines of work. Where such is the case, the foreman is shortsighted who does not make use of these talents. The workman should be given the opportunity to use his genius wherever it can be applied. His reward is in feeling that his talent is being recognized .

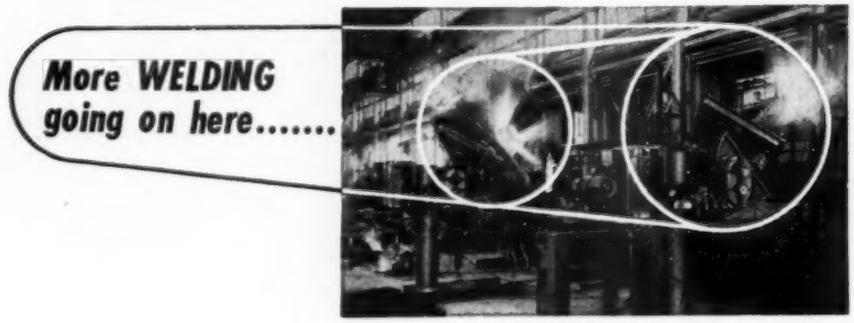
Abel Blakeman
Watervliet, N. Y.

•

Can the foreman outline a job without limiting a skilled worker? Is exact instruction the foreman's prerogative? The answer to these questions will be found in the proper use of job instruction cards.

Under an effective system of labor control, instruction cards for workers are used to record standard methods of performance on the job. The instructions describe the quality standard for the job and may be based on time and motion studies. They represent the cream of accumulated experience acquired in the performance of this particular job.

When the worker experiences difficulty in interpreting the instructions, consultation with the foreman is the next step. In this matter, the foreman will be relieved of unnecessary work and will be able to function in his administrative and super-



More welding and less time spent in flopping, propping up and crawling around weldments is the end result of the C-F Positioners in this welding department.

Mounted on C-F Welding Positioners, weldments can be quickly brought into position for a downhand pass—better, more uniform welds with resulting economies and production increases follow. Welders spend more time welding when they work with C-F Positioners because one "set-up" on the table allows them to maneuver the job without asistance, whether hand or power operated Positioners are used.

Power operated, variable speed C-F Positioners, with table rotation speeds in any range from 0 RPM and up, coupled with table tilt to 135° from the horizontal make them the logical choice for any production welding operation. Like all C-F Positioners they have drilled tables for easy set-ups or tables can be quickly removed for installation of special fixtures or jigs. Write for Bulletin WP 22, CULLEN-FRIESTEDT CO., 1313 S. Kilbourn Ave., Chicago 23, Ill.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

C-F positioned welds mean better, more economical welds

From Little Acorns....

The industrial history of this country is made up of "success stories" in the American tradition —of small businesses which, through the years, have flourished and expanded and become world famous.

Common to all these has been the foresight and the will of the founders to pioneer and the determination of succeeding generations to make their particular product the best in the world. *So it has been with the Greenfield Tap and Die Corporation, the world's leading maker of taps and dies today.*

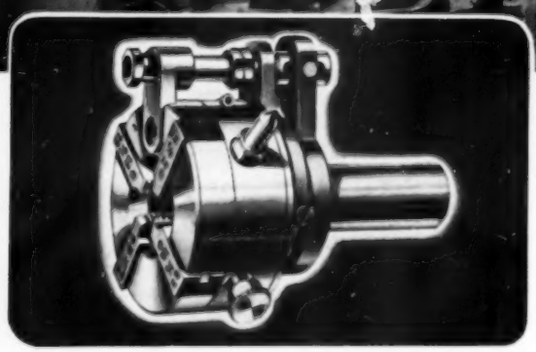
But "Greenfield's" reputation is built not alone on its products. Through a world-wide organization of "Greenfield" Distributors and "Greenfield Men", this company supplies to customers the tools and the "know-how" for every job, wherever threading tools are used.

GTD Greenfield 75th YEAR

The "Greenfield" Distributor brings our shipping room into your backyard, providing you with quick, expert service at all times. When you want threading tools or gages, no need to write a letter . . . just pick up your phone and call the "Greenfield" Distributor.

GREENFIELD TAP and DIE CORPORATION
Greenfield - Massachusetts

The GEOMETRIC TOOL COMPANY
New Haven, Connecticut - In Its Fifty-Fourth Year
A SUBSIDIARY OF GREENFIELD TAP AND DIE CORPORATION



NEW IMPROVED GEOMETRIC STYLE DS CONVERTIBLE SELF-OPENING DIE HEAD — easily converted into four different types of application: Pull-Off Trip or Outside Trip for automatics, Pull-Off or Outside Trip for hand machines. Available in six sizes with cutting range from 1/16" to 1¾".

Backing GEOMETRIC Threading Tools . . .

Here in the Shipping Department of The Geometric Tool Company, in New Haven, Connecticut, each day precision screw thread cutting tools and chasers start their journeys to all parts of the globe. Over land and sea or in the air – by train, plane or truck – every Geometric tool is a precision item of cargo.

Wherever there are metal working machines, there are sure to be threading tools. And the finer the thread cutting tool, the better the work of the threaded part. That is why, no matter where you go, you will find Geometric tools. Because of their accuracy, speed, durability, and ability to produce at low cost, Geometric products are rated high all over the world. And don't forget there is a Geometric tool ready to help solve *your* threading problems.

If you would like to learn more about the new improved Geometric Style DS Convertible Self-Opening Die Head just write today for FREE 8-page bulletin #DS-3 which describes this tool in detail.

THE GEOMETRIC TOOL COMPANY · NEW HAVEN 15, CONN.

A Division of Greenfield Tap and Die Corporation

What has Star got?

Before you pick any motor to power your product we'd like to submit 3 teasers—

". . . and I know 'em all!"

Why did a famous maker of Materials Handling Equipment* not long ago say,— "There isn't a Brake Motor built that can touch that Star, and I know 'em all"?

". . . you like 'em tough"

Why did one of the world's biggest makers of Machine Tools* recently choose Star to work with on a tough application problem?

". . . laying it in your lap"

Why did a noted Dairy Machinery company* pick Star to develop a unique heavy duty motor for their new machine?

(**Name on request*)

We needn't tell you that buyers like these three are motor-wise, and hard-boiled in their determination to obtain the most satisfactory solution to powering their products. . . .

And we needn't tell you that we have engineering brains second to none, or that we have excellent production facilities. Without them, we could not get to first base. . . .

What, then, is the "something extra on the ball" we *must* have to lead such concerns to choose to work with Star on their new products?

You'll find it's Star's approach to a motor problem—a willingness to give your job "top billing". There's no stop-watch on the brains applied to your problem —and there are not so many problems that we can't apply our best brains to all.

That's why you, too, will choose wisely by making Star your "Motor Department". Our designing facilities can be placed at your command NOW, to solve any problems not covered by standard Star Motors, from ½ to 200 HP. Star Electric Motor Co., 200 Bloomfield Ave., Bloomfield, N. J.

STAR MOTORS

POWER PACKAGED AS YOU NEED IT

MODERN
MICROHONING is
AUTOMATIC
PROCESSING CONTROL

4 COMBINED RESULTS IN ONE PROCESS
★ GEOMETRIC ACCURACY
★ AUTOMATIC SIZE CONTROL
★ HEAVY STOCK REMOVAL
★ FUNCTIONAL SURFACE FINISH

MICROMATIC HYDROHONERS
equipped with Microhoning Tools

in many different installations have cut total processing by one or two operations—have reduced the over-all amount of waste stock removal—have generated uniform final size AUTOMATICALLY within 0.0001 to 0.0003-inch—eliminated selective fits in some parts—reduced inspections to one or two spot checks per shift.

The highlights of Modern Microhoning are available in sets of several booklets. Don't you want a set?

MICROMATIC HONE CORPORATION
8100 SCHOOLCRAFT AVE. • DETROIT 4, MICHIGAN
Los Angeles, Calif. • Houston, Texas • Rockford, Ill. • Guilford, Conn. • Brantford, Ont., Can.

visory capacity without interruption.

In following the instructions listed on the card, the skilled worker should be encouraged rather than limited in his interpretation of their exact applicability to his particular job. In this manner, a more efficient and economical method may be determined and the standard instruction card for the job revised accordingly.

Harry Kaufman
Philadelphia, Pa.

•

It takes years to make a good toolmaker, and during this time it is to be expected that a man has acquired much knowledge and initiative which can be applied to his work.

Many foremen give a man a job and tell him to go ahead and use his own methods. Then they watch the progress of a job, and when it is taking more time than is normally allowed, or the toolmaker is having trouble, they step in and assume the part of "trouble-shooter."

It seems to me that if the toolmaker isn't too stubborn, or thinks he "knows it all," he'll take any orders or advice given to him. The mark of an educated man is to be open-minded.

The foreman can safely give out his work without having to limit the skilled worker in how he does it. Given enough rope, a man will show what he is or isn't capable of.

Edward Diskavich
Torrington, Conn.

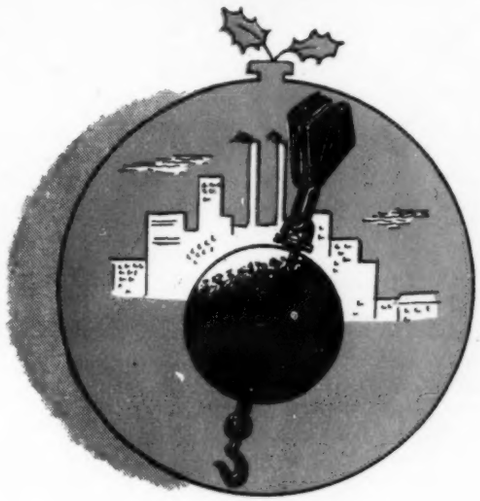
NEW BOOKS

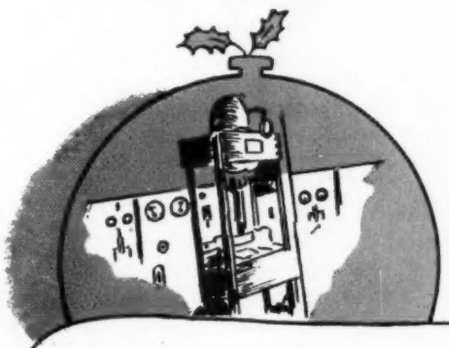
WORKBOOK COURSE IN MECHANICAL DRAWING. *By S. L. Coover, director, Industrial Arts Dept., State Teachers College, Califorina, Pa. Published by McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 18, N. Y. 201 pages, 94 tear-out work sheets, 8½ x 11 in., paper. Price $1.48.*

Here is a practical high-school text differing widely from the standard presentation of mechanical drawing. Standard symbols, abbreviations and blueprint terms are handled first, using the most familiar examples possible. Single-view drawings or plans are illustrated by athletic fields, floor plans and maps, all stressing the importance of accurate measurements. Orthographic and isometric drawings are discussed next with the aid of an all-glass box

Noël

and Know How





THIRTY YEARS AGO, Industrial Plants Corp. was formed for one purpose: to liquidate your frozen assets. The complex character of such an enterprise has been the life's work of one family. From these generations of broad, practical experience has come "Know How."

IPC has consistently followed a progressive policy and today stands pre-eminent in its field. Initiative, integrity—plus "Know How"—have gained for us a host of happy clients. Our record of achievement is probably best reflected in the exceptional attendance and consistently high returns that mark our sales.

Our knack of tackling knotty liquidation problems is known across the country. If you have one and it comes under the heading of selling an idle or unprofitable plant, surplus machinery or inventory, consult us and learn about "Know How"—as the following have in the past year:

U. S. Army,
Voorheesville Sub Depot,
Schenectady, N. Y.

Harlan-Hollingsworth,
Wilmington, Del.

York Industries,
York, Pa.

William Seller & Co.,
Philadelphia, Pa.

Superior Products Co.,
Lynn, Mass.

Duramold Division,
Fairchild Engine & Airplane Co.,
Jamestown, N. Y.

Tacony Tool & Machine Co.,
Philadelphia, Pa.

Saunder Machinery Co.,
Yonkers, N. Y.

E. W. Bliss Co.,
Brooklyn, N. Y.
(Surplus Machinery)

Knott & Garilus,
Detroit, Mich.

City Forge, Co.,
Toledo, Ohio.

Roy Tool & Engineering Co.,
Detroit, Mich.

Cornell Tool Co.,
Ferndale, Mich.

Dearborn Machinery Movers,
Dearborn, Mich.

Toledo Millwork Co.,
Toledo, Ohio.

Trylon Tool Co.,
Detroit, Mich.

American Utility Products, Inc.,
Detroit, Mich.

General Metal Mfg. Co.,
Toledo, Ohio.

Capitol Tool Co.,
Detroit, Mich.

Panelectric Corp.,
Norwalk, Conn.

Aircraft Template Co.,
Rockford, Ill.

Telmor Products Corp.,
Chicago, Ill.

Eastlawn Mfg. Co.,
Detroit, Mich.

G. J. Becker Machine Co.,
Chicago, Ill.

F. P. Miller Co.,
Jackson, Mich.

Lakeside Plastics & Engraving Co.,
Minneapolis, Minn.

East Shore Machine Products Co.,
Cleveland, Ohio

S. & B. Tool Co.,
Detroit, Mich.

Manufacturers' Machine Shop, Inc.,
Cleveland, Ohio

Gordon Van Tine Co.,
Davenport, Iowa.

Emmett Mold, Inc.,
East Akron, Ohio

INDUSTRIAL PLANTS CORPORATION

NEW YORK — CHICAGO — TOLEDO — PITTSBURGH

AUCTIONEERS - APPRAISERS — LIQUIDATORS

ThredKut *
INCREASED OUTPUT
4 to 1

... reports
JOHN L. MOROSINI
D. A. Stuart Oil Co.
Representative

"Prior to using THREDKUT,* this customer had tried several types of cutting oil in tapping 1½" dia. x 1" holes in very tough cast steel, with a maximum production of 50 tapped holes before sharpening was necessary. On switching to THREDKUT,* output immediately increased to 200 tapped holes between sharpenings. Here is another instance where THREDKUT* demonstrated its well-established reputation for licking a tough job."

John L. Morosini

ThredKut *

... Stuart's THREDKUT is a unique cutting oil carefully manufactured to insure the maximum benefits from controlled chemical activity. Its outstanding performance on really tough jobs has long been recognized and its flexibility proved through exceedingly widespread use. The many time-tested values built into THREDKUT are serving the leaders of the metal-working industry, increasing efficiency and reducing costs.

Ask to have a Stuart Service Engineer discuss your cutting fluid requirements. THREDKUT literature available on request.

STUART *service goes with every barrel*

WRITE FOR DETAILS

D.A. Stuart Oil Co.

2729 SOUTH TROY ST., CHICAGO 23, ILL.

which permits the student to trace the elevation, plan and end views of any object placed inside the box.

Frequently used shop projects are here handled first as drawing problems, enabling the student to tie in the work of two or more subjects. Complete information and specifications for building a husky little 6-volt series motor are provided, for instance, giving a practical working acquaintance with many kinds of materials, tools, shop practices, and teaching the fundamentals of electric motors, both in addition to the primary purpose of mechanical drawing.

Much of the work can be done on the perforated pages included as the principles rather than the perfection of drawing technique are stressed.

•

Proceedings Third Annual Spring Meeting of Metal Powder Association. 70 pages. Published by the Metal Powder Association, 420 Lexington Ave., New York 17, N. Y. Price $2.50.

The several papers given at this meeting last May, together with discussions and illustrations, have been reprinted in convenient form. Subjects covered by the speakers were: stainless steel powder, new developments in production of powder metal parts (at Ford); cost calculations, and a panel discussion on: (1) apparatus for air classification of metal powders, (2) bearings, bushings and allied products, (3) copper-lead bearings from metal powder, (4) electrical components from metal powders, and (5) metal powders as pigments.

•

THE TECHNIQUE OF GETTING THINGS DONE—*By Dr. Donald A. Laird and Eleanor C. Laird. Published by Whittlesey House, 330 West 42nd St., New York 18, N. Y. 310 pages, 5½ x 8 in. Price $3.*

Donald Laird is a well-known applied psychologist, particularly in the field of helping people to success. His lectures and books (personal analysis, leadership, handling people, purchasing, selecting employees, selling, etc.) are well known to many. Here he and Mrs. Laird have taken "secrets of success" from the lives of more than 300 men and women and assembled them into a pattern for anyone to follow.

Broadly speaking, their thesis is that most of us lack neither brains nor ability, but that we fail to exercise our wills to control our efforts. They have, in effect, provided examples to prove such old saws as: "The way to take a journey is to take the first step."

Theirs is a tight, strict program of character building, saying "no" to activities that waste time, choosing friends who are not time wasters or idlers (or even pleasant people who can't "help" you), forcing yourself to do things despite lack of interest or even physical disability.

A compendium of magazine articles and speeches, this is a pep talk or sermon, if you will. It makes the point of its title over and over again. If you profit by example and appreciate a direct "talking to," this is your book.

•

ILLUSTRATED JIG-TOOLING DICTIONARY—*By Torger G. Thompson and Ross A. Peterson. 349 pages. Published by The Macmillan Co., 60 Fifth Ave., New York, N. Y. Price $7.50.*

Functional, perspective drawings of high quality are used to illustrate over 1000 "tooling" terms. And these terms are further defined by references to the sketches. As a consequence, the book is exceptionally valuable to those having need of such a dictionary. And it is surprising how much use a reference book of this sort will have in the course of a year, especially if it is available to a department.

Many allied terms, procedures, formulas, processes, and special terminology are covered in the book.

One matter should be understood by prospective purchasers of this illustrated dictionary. The authors speak largely from experience in aircraft manufacturing. In that industry, a "fixture" is commonly called a "jig." That is the case with this book, and many of the practices listed pertain to aircraft-parts manufacture and assembly.

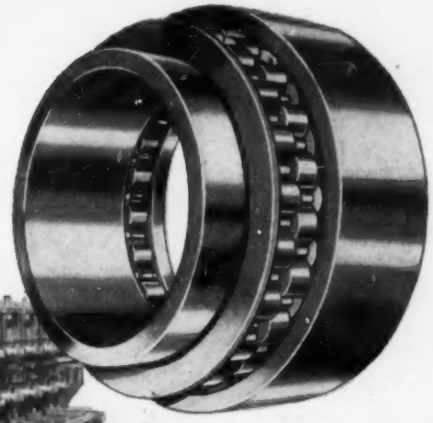
•

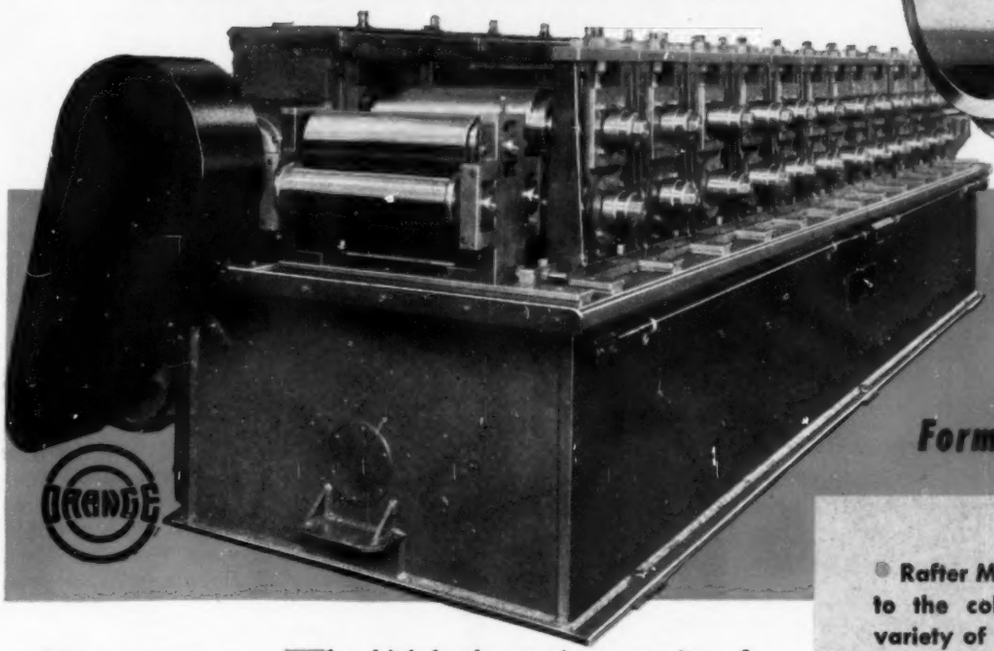
TEXTBOOK OF THE MATERIALS OF ENGINEERING—*By Herbert F. Moore, Research Professor of Engineering, Emeritus, Engineering Experiment Station, University of Illinois. Seventh Edition. Published by McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 18, N. Y. 500 pages. Price $5.00.*

Designed for engineering students and tested with 30 years of use, this latest edition includes information on recently developed structural and load-carrying metals and nonmetallic building materials. Representative and widely used materials

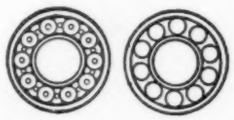
Close Tolerance under High Stress

ORANGE
"STAGGERED"
ROLLER BEARINGS

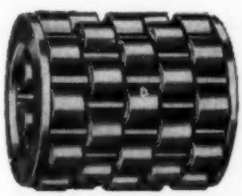




used for over 10 years in RAFTER Cold Roll Forming Machines



Shown above are end views of an Orange Staggered Roller Bearing and a conventional bearing. Note how staggered design brings maximum roller surfaces in contact with load.



The high-load carrying capacity of Orange Staggered Roller Bearings makes them especially valuable for heavy duty installations. They do the work of larger-size conventional bearings and stand up longer under severe operating conditions.

The exclusive staggered roller design provides maximum supporting area in minimum space. Smooth, precision running is assured, due to ease of alignment and adjustment of rolls in the raceway load area. Spaces between rolls act as lubrication pockets.

Orange Staggered Roller Bearings are made in a **full range of standard sizes, interchangeable with other solid race type bearings,** and carry the same identification numbers. Send for Engineering Data Book which shows design, dimensions, capacities, etc.

Rafter Machines are adaptable to the cold roll forming of a variety of steel partitions, refrigerator cabinets, metal door frames and other steel sections. Orange Staggered Roller Bearings are installed in the outboard housing supports because of their close tolerance and high load-carrying capacity. The Rafter Machine Company, Belleville, N. J., reports perfect satisfaction with the smooth-running accuracy and stamina of these bearings after 10 years of continuous service.

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., AM
Orange, N. J.

Please send me your Staggered Roller Bearing Data Book

Name..... Title.....

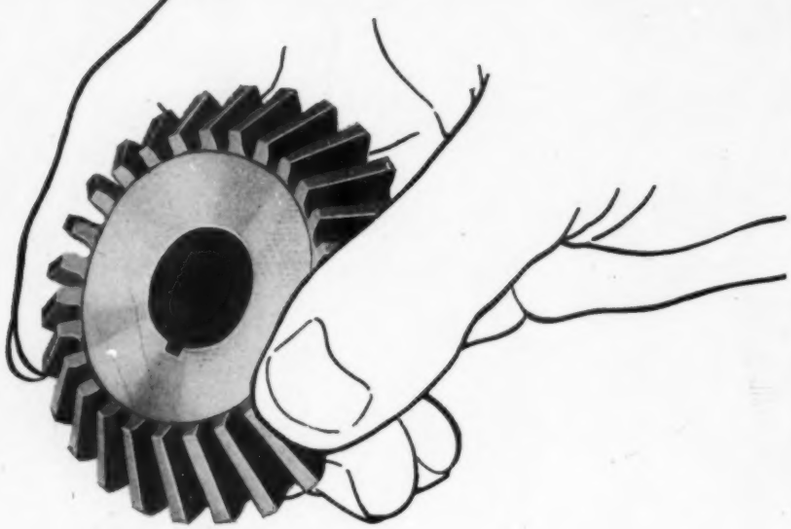
Company.....

Address.....

City..... State.....

ORANGE ROLLER BEARING CO., INC.
554 Main Street, Orange, N. J.

PERKINS' contribution to industry
trouble-free power transmission



Whatever your gear requirements may be, we have the experience, equipment and facilities to fulfill them to your complete satisfaction.

Since the proof of the pudding is in the eating it may be pointed out that the manufacturers of the type of consumer goods which have a world-wide reputation for quality use PERKINS Custom-Cut GEARS as a matter of course.

You Furnish the Specifications • We'll Produce the Gears

• **PERKINS MAKES — In All Materials, Metallic & Non-Metallic** Helical Gears Bevel Gears, Ratchets, Worm Gears, Spiral Gears, Spur Gears, Ground Thread Worms

PERKINS MACHINE & GEAR Company
Springfield 2, Massachusetts

Our extensive facilities and modern machine tools are also adaptable to the manufacture of all kinds of various parts other than gears, such as the following:

SPROCKETS SPLINED SHAFTS SCREW MACHINE PARTS
up to 2¼" in diameter

We are also exceptionally well equipped to build, to your specifications, such mechanical units as—

PUMPS • SPEED REDUCERS & COMPLETE MACHINES
either in experimental or production quantities. Our well-known reputation is your guarantee of satisfaction. Let us quote on your requirements.

are discussed in complete detail from their production and utilization standpoints so mechanics and strength of materials, both theoretical and practical as well as metallurgy and chemistry are covered where applicable.

About half the book is devoted to metals with particular emphasis on steels, the rest to wood, stone, brick, terra cotta, cements, concrete, plastics, rubber, leather and rope. The first few chapters deal with the manner in which materials fail and the types of failure, and how to select materials properly with an eye to the factor of safety.

Although intended for classroom use, the material is presented in such a way that the book will serve as a useful reference volume for any engineer.

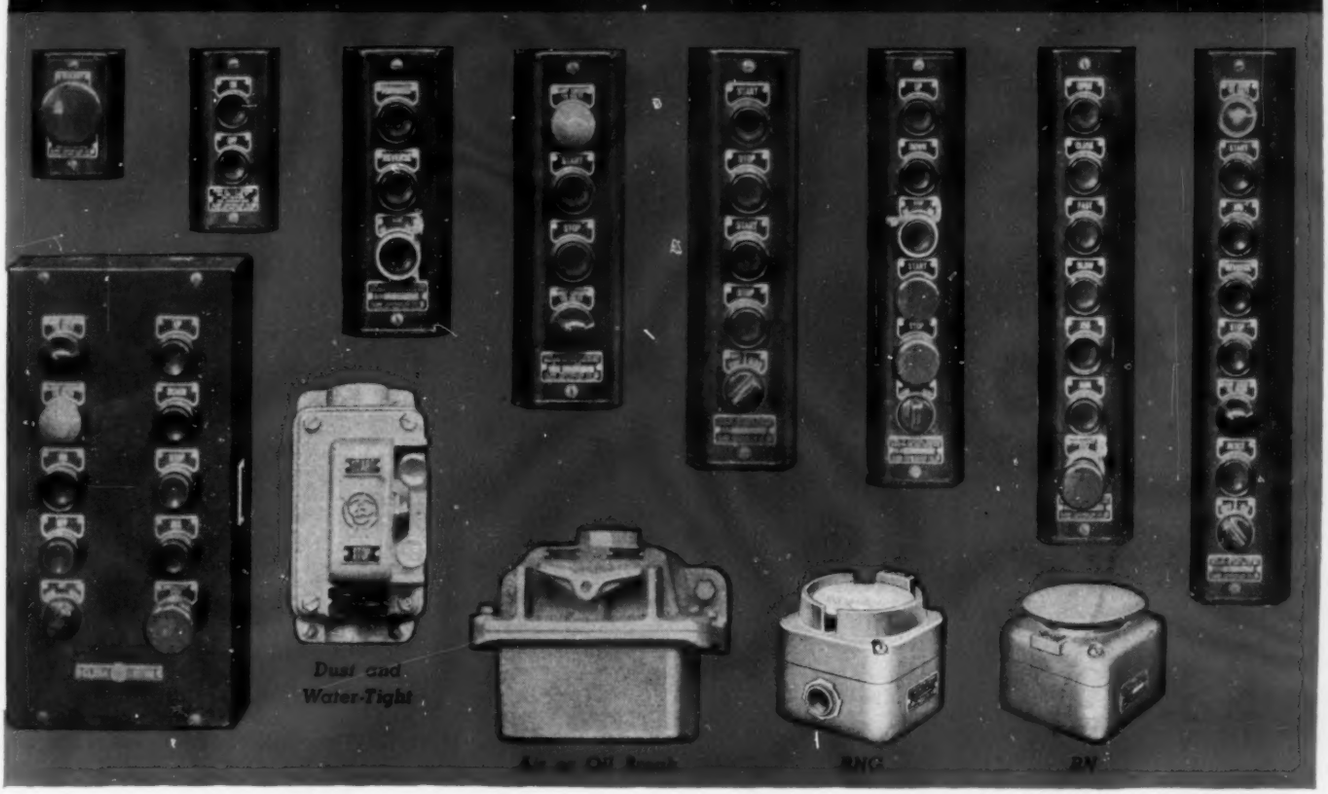
SEEN and HEARD

By JOHN R. GODFREY

Sub-Contract Operators

THIS TALE of the Market Specialties Co. in their shop in Cleveland (*AM*, Aug. 14) takes me back, both in memory and in history. Many shops such as the Colt Armory, Lincoln Iron Works, and I think Pratt & Whitney, ran what we called "contract shops." It was common practice. As far as I know the Baldwin Locomotive Works still has subcontractors for many locomotive parts such as cylinders, connecting rods and the like. Here the subcontractor was a sort of foreman who hired the men for what they would take. The company paid them and charged them against his contract. Both Frank Pratt and Amos Whitney started out as contractors in the Colt shop and presumably carried the same system into their own shop after they formed the Pratt & Whitney Company. This develops management in the foremen as well as ability in economical production and successful handling of men. How it will work in shops which are organized remains to be seen. And the individual contracting, as with the small shop first cited, can only apply to a small percentage of manufacturing such as toolmaking and similiar work. Large shops building a regular line can hardly have each man a contractor on the individual operation he performs. But it is an interesting development and I'll be glad to know how it pans out in Cleveland.

WANT TO START SOMETHING?
use CLARK PUSH BUTTONS!



For Heavy-Duty and Standard actuating service there's a CLARK Push Button, specially engineered and manufactured for such types of application. The Type D heavy-duty line, which includes Pilot Lights and Selector Switches is available in enclosures from 1 to 8 units in a line or 10 units in a double row. For hazardous locations—Class I Group D—the enclosure provides for air break or oil immersion. Dust-tight and water-tight (NEMA 1C 50-28, 1C 50-43) enclosures are available.

Type DO, oil-tight Push Buttons, Pilot Lights and selector switches are available for machine tool applications.

Type RN and RNG, the ROUGHNECK, permits rough usage—even as a foot switch—with no damage to the Push Button Unit.

Type EE
Standard Duty

Push Button, Pilot Light and Selector Switch units are available for flush or back-of-board mounting on slate or steel panels.

For standard duty, for use with Contactors or Starters no larger than Size 4, 150 amperes, Types EE and DB are available.

For Your Push Button needs—There's a CLARK Button available.

THE CLARK CONTROLLER CO.

EVERYTHING UNDER CONTROL • 1146 EAST 152nd STREET, CLEVELAND 10, OHIO

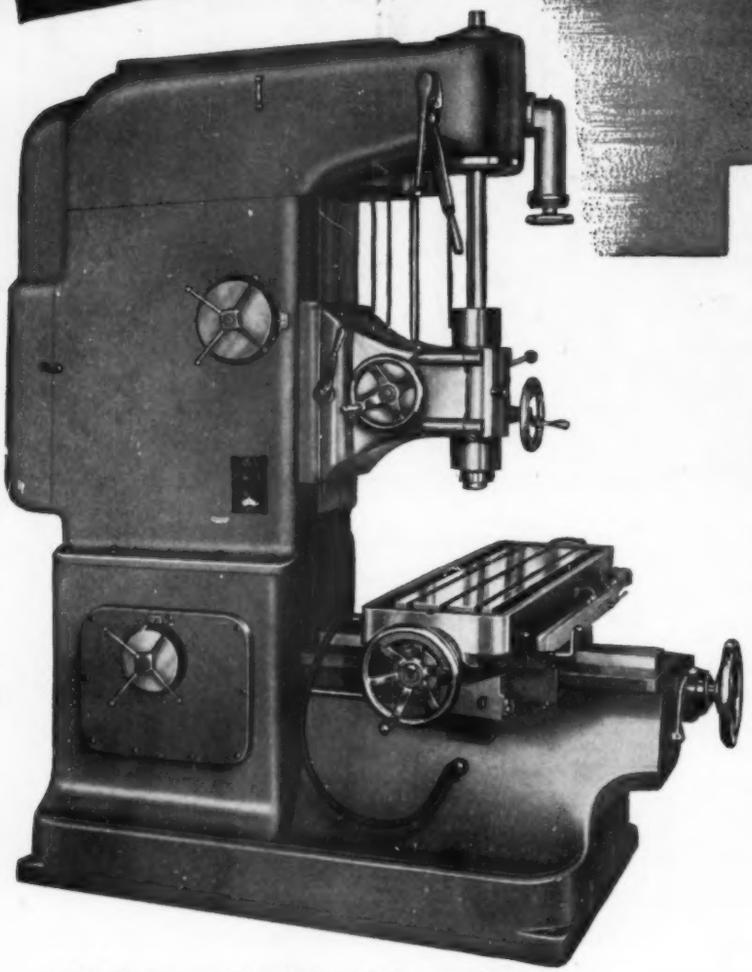
Fast, Accurate Production

More Economically

with the New

No. 50

PRECISION BORING and VERTICAL MILLING MACHINE



The unusual production economy of the new Knight No. 50 is achieved by combining, in a single solid base machine of exceptional range, all the features required for both precision boring and vertical milling. The elimination of time-wasting extra setups and transfers of work save costly labor and make possible much higher output at far lower costs. With a working capacity of greater range than other machines of comparable size, there is also power to spare in the rugged No. 50 for easily and speedily handling the toughest jobs in any shop.

- *16 Spindle speeds from 40 to 2000 r.p.m.*
- *9 Spindle feed from .005" to .010"*
- *100" per minute table traverse, both directions*
- *16 Table feeds, 5/16" to 20" per minute*
- *7½ H. P. drive*

Write Today for Catalog Information

W. B. KNIGHT

MACHINERY COMPANY

KNIGHT VERSATILE MILLERS ACCURATE · RIGID

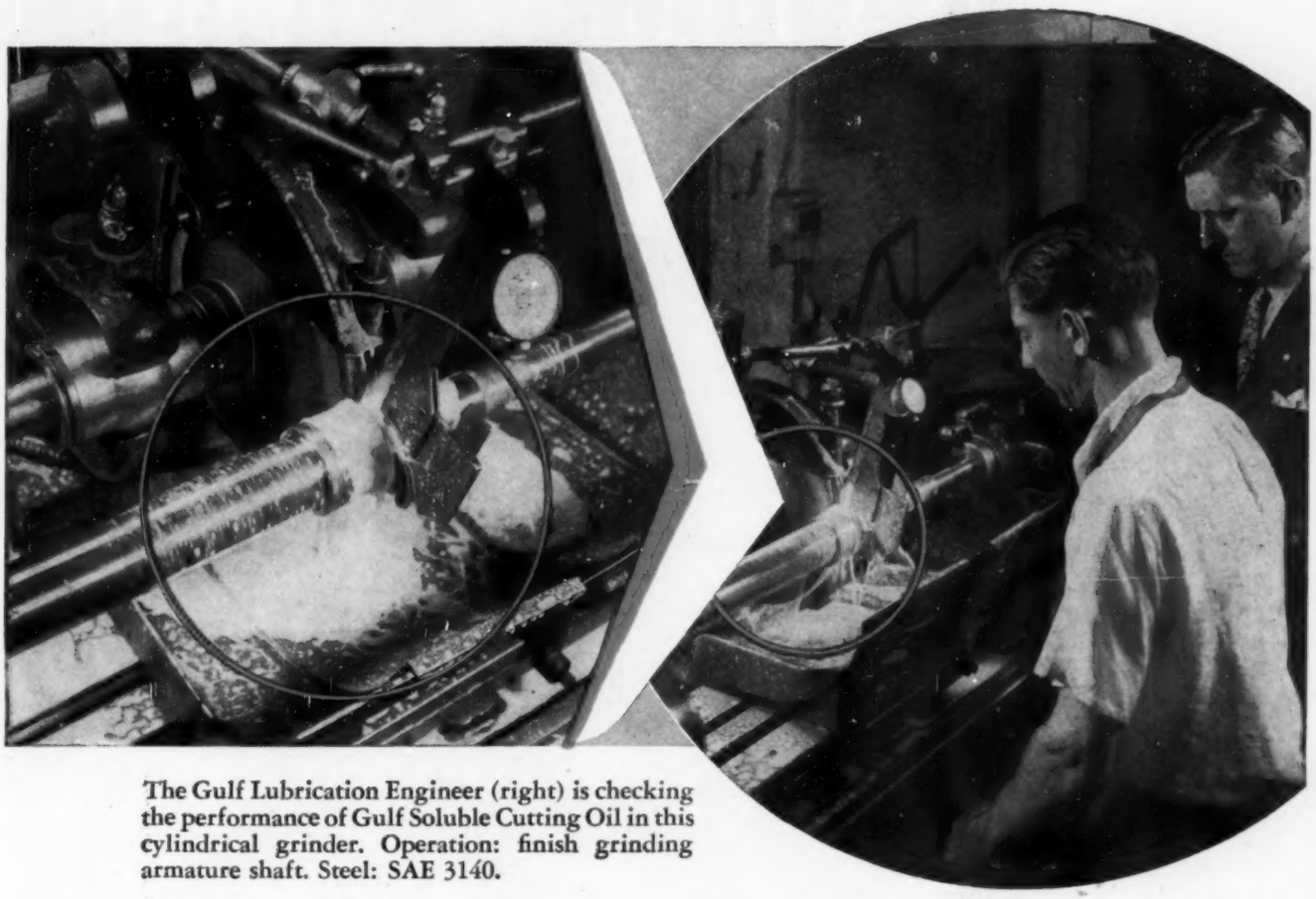
MORE GOODS for MORE PEOPLE at LOWER COST

3920 WEST PINE BLVD. • ST. LOUIS 8, MISSOURI

"Gulf Soluble Cutting Oil

keeps our grinding wheels clean and free-cutting"

says the management of this progressive plant



The Gulf Lubrication Engineer (right) is checking the performance of Gulf Soluble Cutting Oil in this cylindrical grinder. Operation: finish grinding armature shaft. Steel: SAE 3140.

"AFTER SEVERAL UNSUCCESSFUL attempts to eliminate rancidity and wheel loading, we switched to Gulf Soluble Cutting Oil," says the management of this progressive plant. "With this fine soluble oil, we've solved our problem once and for all—our grinding wheels are always clean and free-cutting."

"Gulf Soluble Cutting Oil also gives us effective protection against rust, forms an exceptionally stable emulsion, and doesn't gum up our machines."

A typical report from the ever-growing group of progressive plants who use Gulf Soluble Cutting Oil! Preferred because it combines all the qualities needed to do a better machining and grinding job: exceptional stability, improved miscibility, effective rust preventive properties, pleasant odor—and it's non-foaming.

For further information on Gulf Soluble Cutting Oil—and for one of Gulf's practical slide-rule type calculators, which will help you maintain desired soluble oil concentrations—send the coupon below.

Gulf Oil Corporation · Gulf Refining Company

Division Sales Offices:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

GULF INDUSTRIAL LUBRICATION

AM

Gulf Oil Corporation · Gulf Refining Company
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, the material I have indicated below:

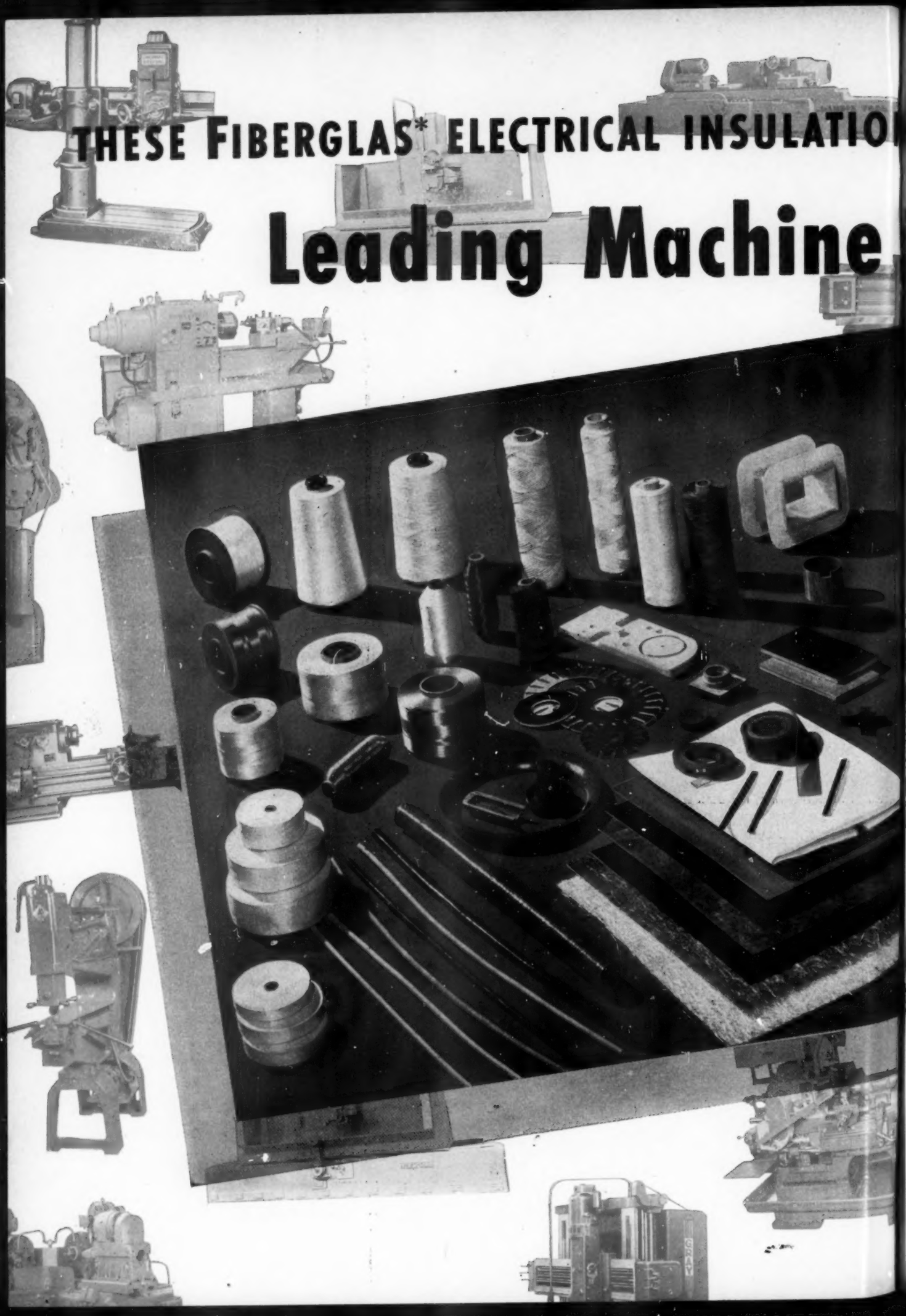
- ☐ Further information on the new Gulf Soluble Cutting Oil.
- ☐ Practical slide-rule-type calculator for help in maintaining desired soluble oil concentrations.

Name.....

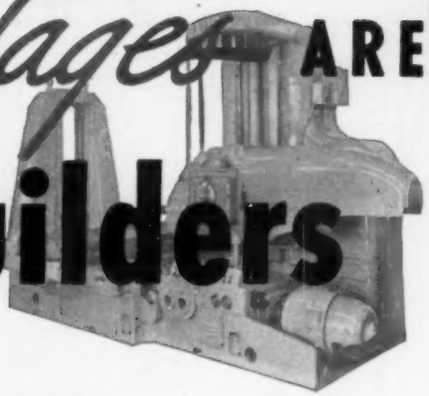
Company.....

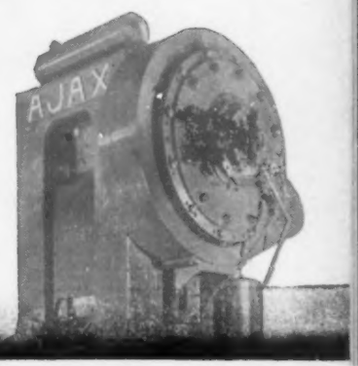
Title.....

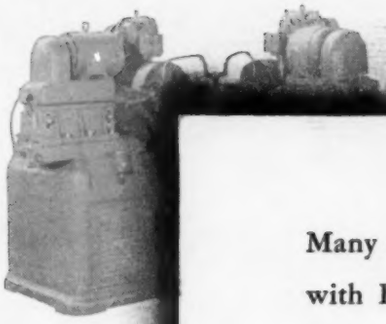
Address.....

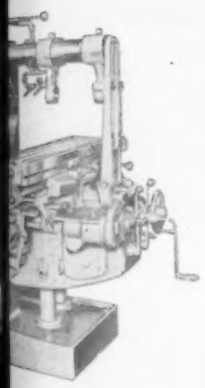

THESE FIBERGLAS* ELECTRICAL INSULATIO
Leading Machine

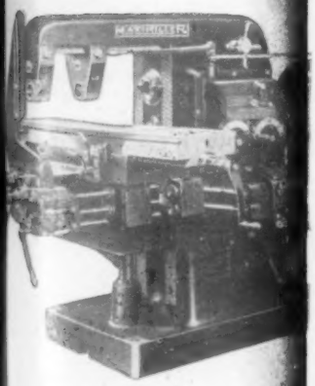
...Advantages ARE PROVIDED BY ...e Tool Builders











Many machine tool builders are now equipping their machine tools with Fiberglas-insulated motors—motors that assure *extra stamina, longer life* and *lower operating cost.* Fiberglas Electrical Insulating Materials protect motors against the effects of sudden thermal shocks and permit greater variations in winding temperatures. They also help to reduce the number of costly breakdowns caused by oil vapors, metal chips and coolants. In many instances, they have resulted in appreciable increases in the operating efficiency of the machine . . . for instance, one machine tool builder was able to increase greatly the reversal capacity to an extent not possible with other insulating materials. Fiberglas Electrical Insulating Materials offer many new design possibilities such as important savings in weight per horsepower and in over-all floor space.

Write today for your copy of "For Machine Tool Users Only", the new booklet which contains facts about Fiberglas-insulated machine tool motors. Write Owens-Corning Fiberglas Corporation, Dept. 865, Toledo 1, Ohio. Branches in principal cities.

In Canada: Fiberglas Canada Ltd., Toronto, Ontario.

OWENS-CORNING

FIBERGLAS

ELECTRICAL INSULATING MATERIALS

*Fiberglas is the trademark (Reg. U. S. Pat. Off.) for a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.

★ 4 BIG REASONS WHY

the Standard COULTER "HT" Thread Milling Machine IS THE MACHINE FOR YOU!

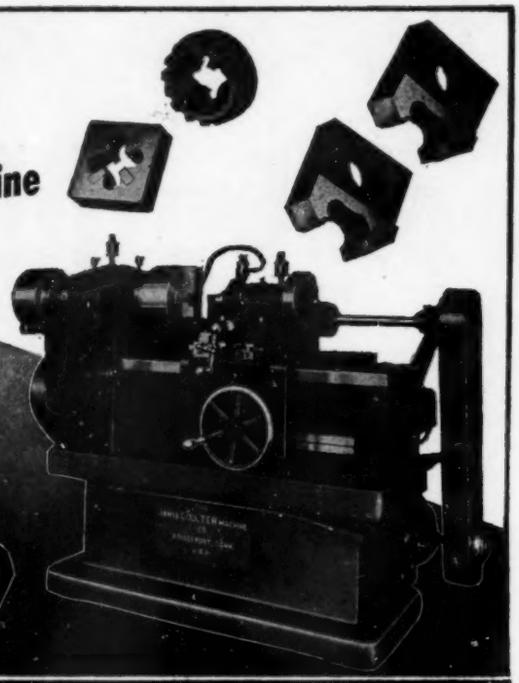
★ Any number of Lands eccentric or con-eccentric relief can be produced. Dies from ⅜" up to 2"

★ Equipped to give cutter speeds with infinite changes from 100 RPM to 650 RPM

★ Can thread round, square and inserted chaser dies

★ The most economical of ALL threading machines

Write for Full Particulars



PRODUCTION MACHINES SINCE 1896

The James COULTER Machine Co.

BRIDGEPORT • CONNECTICUT • U.S.A.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

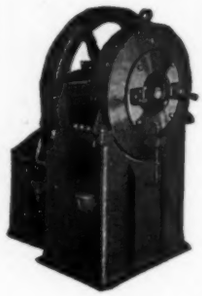
MODEL D-1 DIAL TYPE

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

9025 VAN WYCK AVENUE
JAMAICA, NEW YORK

TELEPHONE: JAMAICA 6-4090



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

ATTAINS 1650° F. QUICKLY
Atmospheric Pot Hardening Furnace

"BUZZER" HIGH SPEED *Gas* FURNACES

. . . are the efficient, economical answer to today's Heat Treating Problems. **NO BLOWER or OTHER AUXILIARY POWER are needed . . . just connect to your gas supply.**

• The Full Muffle Furnace attains a temperature of 2400° F., and The Pot Hardening Furnace, tangentially fired, assures quick even heat up 1650° F. Many other models available.

• Send for the "BUZZER" Catalog showing full line of Industrial Gas Furnaces, Burners and other equipment.

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

ATTAINS 2400° F. QUICKLY
Full Muffle Furnace

HAMMER-GANGS

Like ERIE HAMMERS...

THE "old timers" in Hammer-gangs everywhere like the ruggedness of Erie Hammers . . . their sturdy, unceasing capacity to "take it" coupled with their sensitivity and accuracy of control. Here is an Erie Double Frame Forging Hammer turning out a top quality Forged Crankshaft for heavy duty shaking coal screens. The teamwork achieved by experienced hammer-gangs and Erie Hammers results in profitable forging operations . . . forgings worthy of your name.

Photo courtesy of The McNally-Pittsburg Mfg. Corp., Pittsburg, Kansas

ERIE

Write for bulletin 345 with full details on Erie Double Frame Forging Hammers.

ERIE FOUNDRY COMPANY, ERIE, PA.

ERIE BUILDS *Dependable* HAMMERS

Holiday Greetings
from
Our House to Yours

PRESS-RITE PRESSES
SHAPE-RITE SHAPERS
KELLER POWER HACK SAWS

1948 Models ready for your approval

Sales Service Machine Tool Co.
2363 UNIVERSITY AVENUE, ST. PAUL 4, MINNESOTA

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

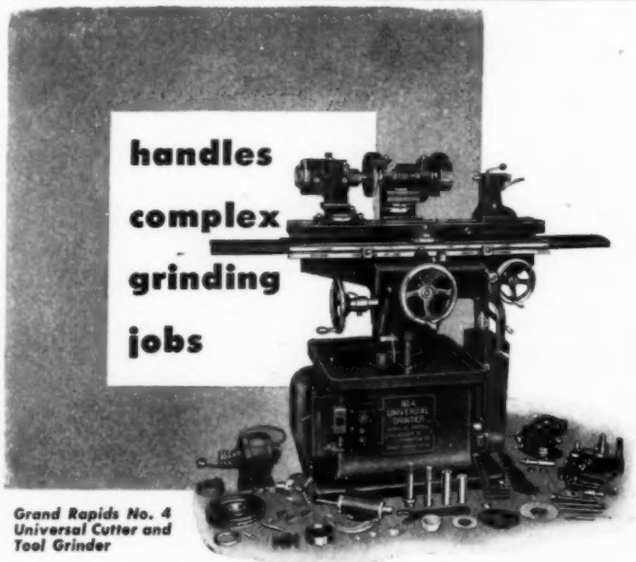
• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

WRITE today for Catalog No. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO



Grand Rapids No. 4 Universal Cutter and Tool Grinder

The extreme flexibility and versatility of the Grand Rapids Universal Cutter and Tool Grinder makes ordinarily complicated grinding operations really practical, convenient, simple and fast.

Write for Bulletin 1045

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

WHAT HAVE ALUMINUM TRUCK BODIES GOT TO DO WITH MY PROBLEM?

JUST THIS. They proved that a change to aluminum from other materials so improved product performance that the consumer thinks of this lightweight metal in terms of savings rather than cost.

"Too costly", said truck body builders before the war. But today they find that with aluminum at an all-time low and its light weight offering 3 times the working area of steel on a pound for pound basis that it is practically a "must" metal. And these "pay-off" advantages appeal to the consumer—greater pay loads, lower fuel costs, increased tire mileage, freedom from rot and rust and even lower license fees.

Remember, too, aluminum's light weight favors the manufacturer as well as the consumer. Pound for pound, aluminum gives three times the working area of steel, brass or copper. It is easier to handle on the production and assembly lines; often eliminates one or more finishing operations and costs less to ship. In other words, add up *all* the savings and you are likely to find that you can offer the advantages of aluminum at the same cost or less.

Yes, there are many factors that go to make up the true cost of aluminum. Failure to consider them all may be costing you the benefits of this modern metal. Reynolds technicians will welcome the opportunity to work with you in the use of aluminum for the betterment of your products and profits. For complete information contact your local Reynolds Sales Office or write Reynolds Metals Company, 2523 South Third Street, Louisville 1, Kentucky.

The price of aluminum has been reduced 30% since Reynolds became a primary producer in 1939.

REYNOLDS METALS

REYNOLDS
THE GREAT NEW SOURCE OF **ALUMINUM**

INGOT • SHEET • SHAPES • WIRE • ROD • BAR • TUBING • PARTS • FORGINGS • FOIL • POWDER

FIRTHALOY

"THE STANDARD CARBIDE"

Firthaloy

brings to your mill these advantages—

- machine speed-up
- minimum down-time
- longer runs
- maximum die life
- uniform quality of products—

the essentials of operating economy

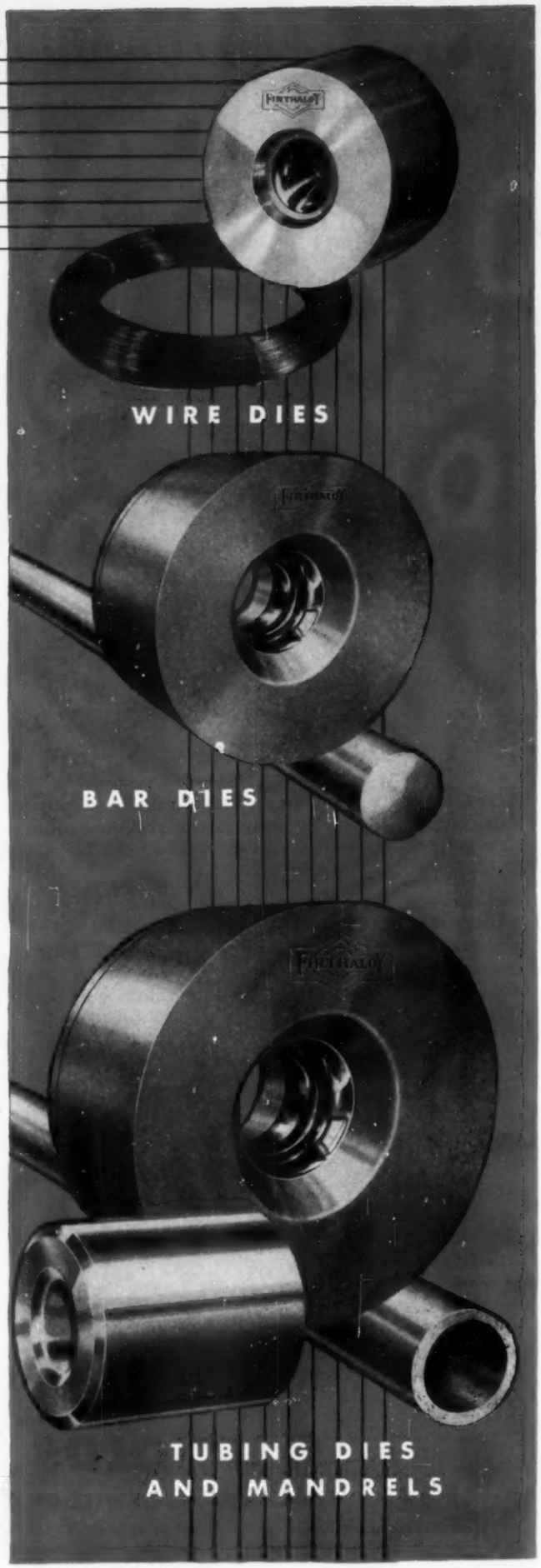
Call

Firth Sterling

STEEL & CARBIDE CORPORATION

McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA • PITTSBURGH

CLEVELAND • DAYTON • DETROIT • CHICAGO • LOS ANGELES



NEW OPPORTUNITY FOR SIMPLIFIED DESIGN

GOOD SHAFT SHOULDERS AND FACE
FACTORY GREASE PACKED. LARGE GREASE CAPACITY. BREATHING AND GREASE EXPANSION SPACE.
STANDARD LOAD CAPACITY
DOUBLE ROW WIDTH. LARGE AREA FOR HOUSING CONTACT.
INSIDE AND OUTSIDE METAL SUPPORTED SEAL.
SUPERIOR DUST EXCLUDING AND GREASE RETENTION CONTACTS.

It's Fafnir's new

WIDE TYPE PLYA-SEAL BALL BEARING

IF YOU can simplify complicated assemblies . . . eliminate parts . . . then you can cut out machining operations. Costs of both manufacture and maintenance come down. That's why manufacturers have said that Fafnir did a lot of things at one time when they developed the Wide Type Plya-Seal Ball Bearing. It has its own grease chamber and breather provision. Contaminants can't get in and grease can't get out.

It's a single row bearing in a double row width. Plenty of room for extra grease, plus room for grease expansion due to aeration under high speeds. Better shaft support . . . no slippage. *Full face* on inner ring for complete shouldering. Three-piece seals . . . synthetic rubber washers supported between two steel retaining rings to prevent buckling or bulging. Proof against common contaminants and temperature extremes. Seals easily removed and replaced as frequently as desired without injury to bearing or seals. It's a ball bearing you can tuck away inside a machine and forget for years, yet it's ready for complete inspection in a minute.

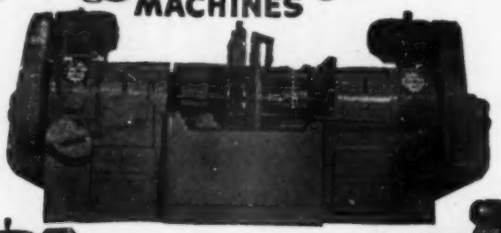
Still another opportunity for machine designers, product engineers, manufacturers to cut out unnecessary parts, to cut costs, to build extra dependability and minimum maintenance into their machines. Your inquiry about the new Fafnir Wide Type Plya-Seal Ball Bearing will receive prompt attention. Fafnir engineers will work mind-to-mind with your engineers. The Fafnir Bearing Company, New Britain, Conn.

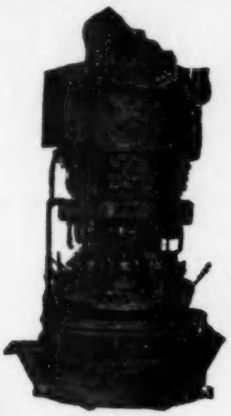
MOST COMPLETE LINE IN AMERICA

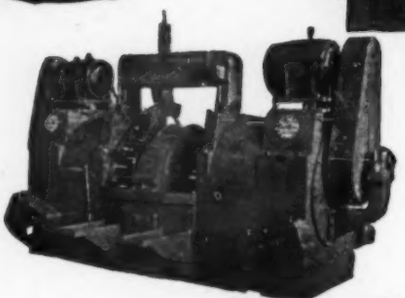
FAFNIR BALL BEARINGS

Roto-Matic Drilling MACHINES

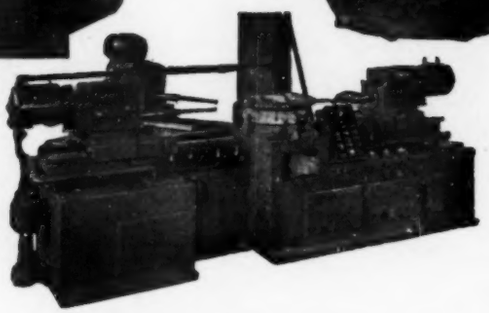
VERTICAL AND HORIZONTAL TYPES







MULTIPLE SPINDLES



Highest Production — Low Maintenance

MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

DAVIS & THOMPSON COMPANY

MANUFACTURERS MACHINE TOOLS, MICROMETERS AND GAGES

MILWAUKEE WISCONSIN

Fluidmotion Radius and Angle Dressers save time in ACCURATE FORM DRESSING

"FLUIDMOTION", an exclusive J & S development, automatically blends any combination of angles and arcs in one continuous motion, with one setting, using one *handle*. Produces clean, precise form without tool or chatter marks. Available in models C, E and F . . . also the Form Master, an accurate lower priced dresser. Send for folder.

Fluidmotion FEATURES

- automatic centering
- .0001" accuracy
- one setting per form
- 14" wheel capacity
- large radius range
- dustproof
- chatterless

*Reg. U.S. PAT. OFF.

J&S TOOL CO. 479 Main Street, East Orange, N. J.

SHELDON

TRB S-56 PRECISION LATHES

TOMORROW'S LATHE FOR SALE TODAY

Just as the S-56 (famous as the wartime's mobile shop and instrument lathe) was well ahead of its time, the new TRB S-56 is definitely a "lathe of tomorrow."

Added to its previous advantages . . . to the same rigid 56" bed, 4-speed V-belt drive with double V belts to spindle, its 1" collet capacity, 1⅜" hole through spindle, and modern 3-drawer steel bench are: a new heavier headstock with large tapered roller bearings and a higher speed range, and increased capacity for heavy work.

The new bearings are not just anti-friction but are "Zero Precision"—the absolutely finest taper roller bearings built.

This is more than incidental improvement . . . it means that every Sheldon TRB S-56 can do accurate precision work, at new high machining speed and maintain its extreme accuracy—can produce more and at lower cost per piece.

Write for new TRB S-56 catalog sheet

From any angle this "tomorrow's lathe" is your best buy today.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

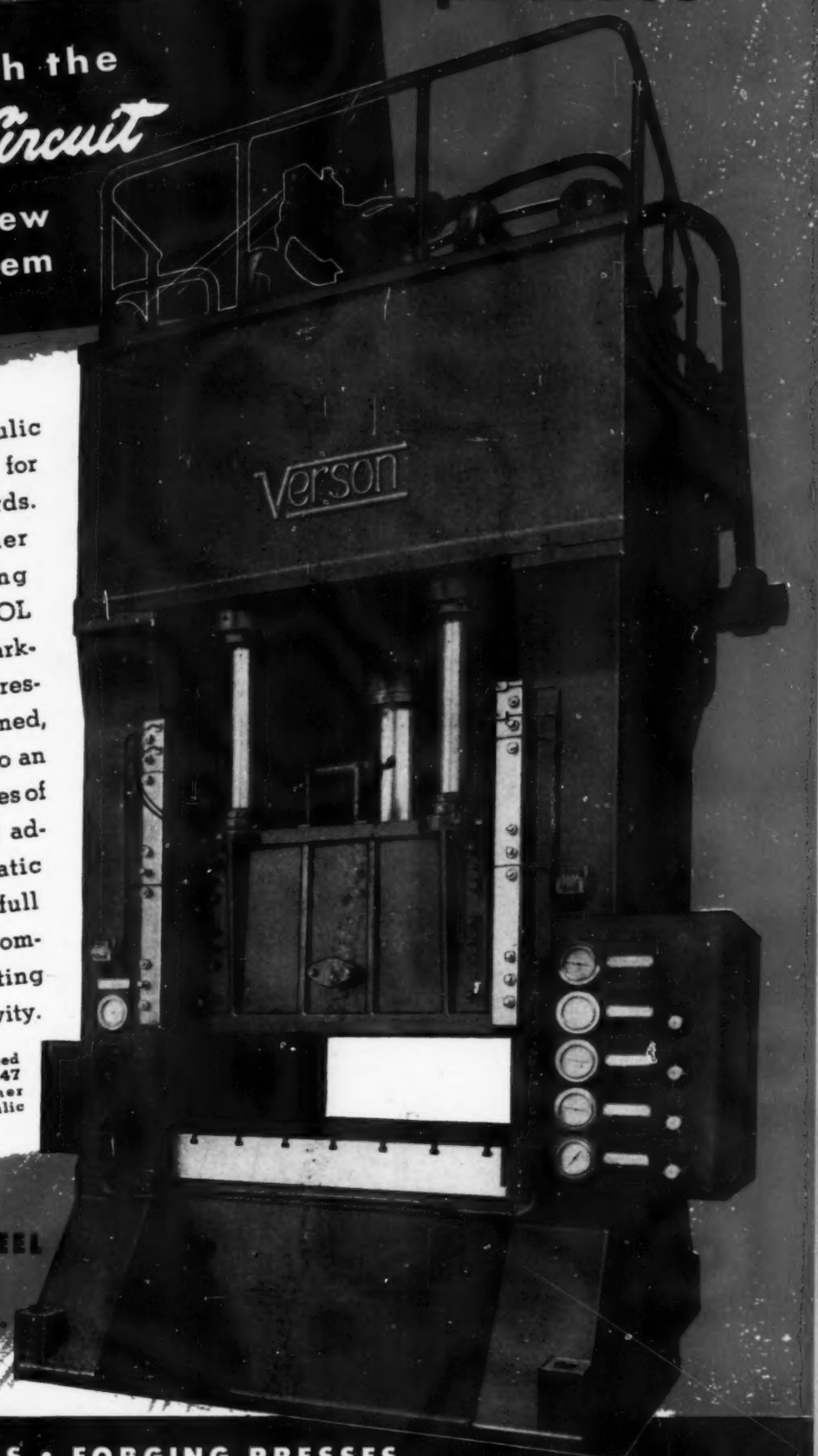
4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U.S.A.

TRADE **Verson** MARK

double action hydraulic presses

now equipped with the HYDROL *Speed Circuit*

. . . the revolutionary new simplified hydraulic system



Verson double action hydraulic presses have long been noted for remarkable production records. Now they have been further improved by incorporating into them the Verson HYDROL Speed Circuit. With this remarkable hydraulic system high pressure lines have been shortened, valving and piping reduced to an absolute minimum. Advantages of the HYDROL circuit are fast advance of ram with automatic shockless changeover to full pressure . . . automatic decompression virtually eliminating dwell . . . greater productivity.

• Details of the HYDROL Speed Circuit are given in Catalog H-47 as well as full data on other features of Verson Hydraulic Presses. Ask for a copy.

VERSON ALLSTEEL PRESS CO.
9312 S. Kenwood Ave.
Chicago 19, Illinois

Originators and Pioneer Builders of Allsteel Welded Presses

OWER PRESSES • CLUTCHES • FORGING PRESSES
IE CUSHIONS • HYDRAULIC PRESSES • PRESS BRAKES

GROUND FROM THE SOLID
BATH
TRADE MARK
JOHN BATH CO.

IT TAKES SOMETHING EXTRA TO BE A *Specialist!*

Just as it takes extra study and effort to become a research chemist, dedicated to the scientific problems of tomorrow . . . so it has taken years of experience in our field to produce BATH ground thread taps . . . toughened by hardening and tempering—then ground from the solid!

We are continually designing special BATH taps to exacting specifications for exceptionally accurate work . . . and this same degree of skill and ability symbolizes the "something extra" you'll find in our standard, stock sizes. That's why when you see the name BATH on any tap, it stands for a "plus value" . . . the experience of specialists! We invite your inquiry on any tap problem . . . see your BATH representative or write direct.

JOHN BATH CO. INCORPORATED

22 Grafton Street
WORCESTER 8, MASS.

GROUND THREAD TAPS • PLUG AND RING THREAD GAGES • INTERNAL MICROMETERS

Sterling

STERLING'S STERMOUNTS offer you a full selection of all the wheels and shapes necessary to solve your problems of grinding out-of-the-way locations in various metals. Available in both vitrified and resinoid bonds, they are the finest abrasive tools you can use with portable or precision equipment.

STERLING'S STERMOUNTS are available in the correct shape, size, grain, bond, and structure. Their detachable spindles are a popular and economical feature that permits you to reorder only the wheel or shape needed. Spindles can be used over and over again to provide extra strength and rigidity when in use.

STERLING'S STERMOUNTS cut readily without undue pressure being exerted on the work. They have the toughness to assure long grinding and are built to take the punishment of continued use on difficult jobs.

STERLING'S STERMOUNTS provide an economical grinding service that has been tested on thousands of jobs throughout industry . . . Their application to your particular problem is simple . . . a Sterling engineer will gladly tell you about it.

This attractive folder lists and describes Sterling Stermounts. May we send your copy?

Goss & DeLeeuw

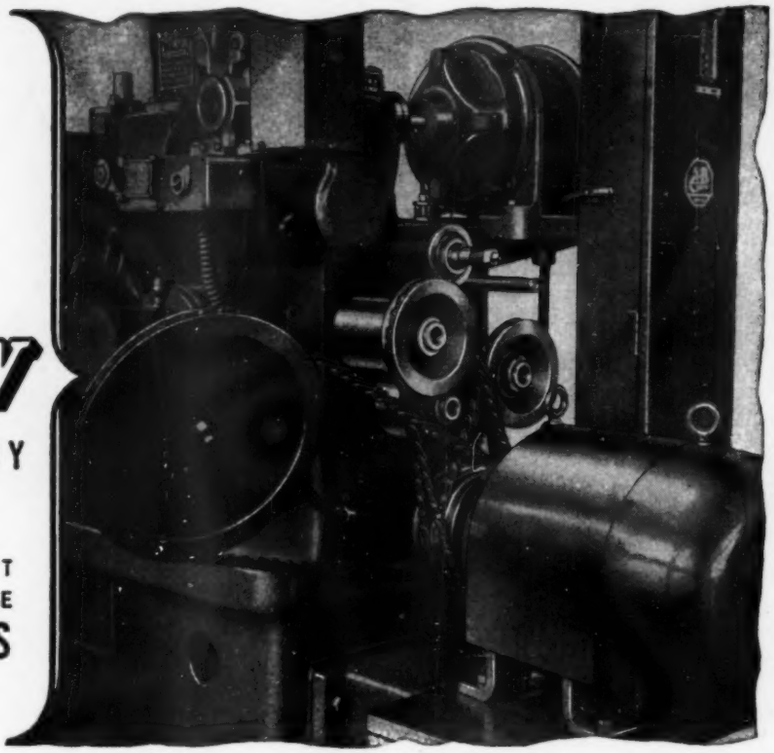
MACHINE COMPANY

KENSINGTON · CONN.

★

THE WORLD'S FINEST MULTIPLE SPINDLE

CHUCKING MACHINES

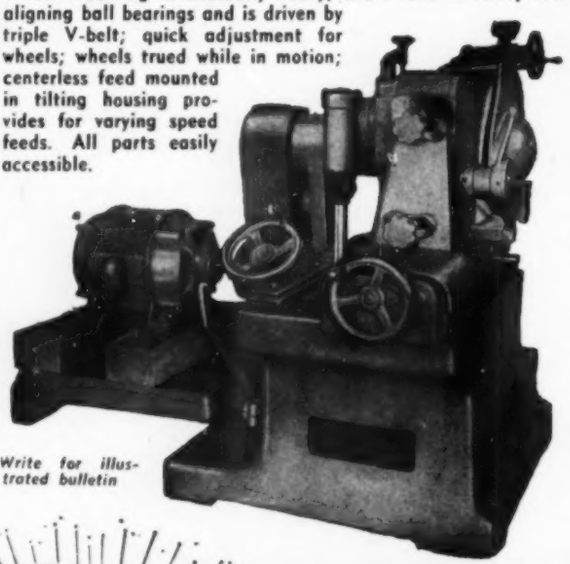


Put your cylindrical finishing on the CENTERLESS FEED No. 101 "PRODUCTION"

and get better work at lower cost

Any grade finish at fastest feeds and lowest costs can be obtained with this machine.

Wheel mounting is unusually heavy; shaft runs in heavy self-aligning ball bearings and is driven by triple V-belt; quick adjustment for wheels; wheels trued while in motion; centerless feed mounted in tilting housing provides for varying speed feeds. All parts easily accessible.



Write for illustrated bulletin

Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

For Faster Smoother Cleaner *Grinding*

ECONOMY

Grinding and Cutting Oils and Lubricants for Every Metal Working Purpose

THE WHITE & BAGLEY COMPANY

WORCESTER, MASS. • DETROIT, MICH.

"ROCKWELL" HARDNESS TESTER

Made Only by Wilson

• Development and improvement of "ROCKWELL" Hardness Testers over the years have made "ROCKWELL" scales the universal standard of hardness. A reading on the "ROCKWELL," the "ROCKWELL" Superficial or the "TUKON" Tester is the same in any language.

WILSON MECHANICAL INSTRUMENT CO., INC. ACCO

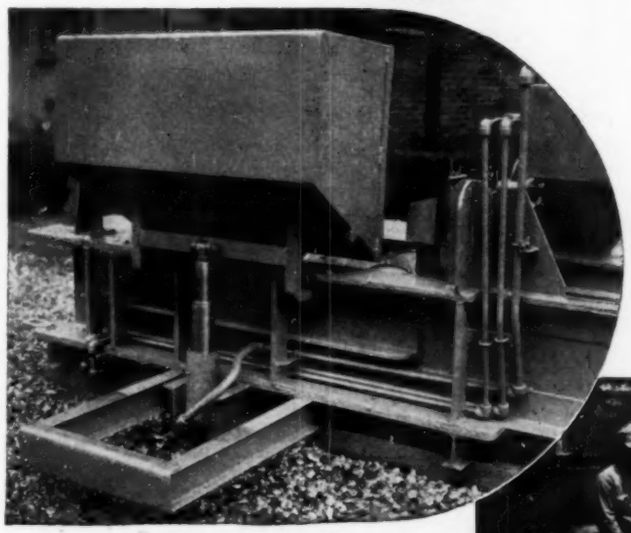
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

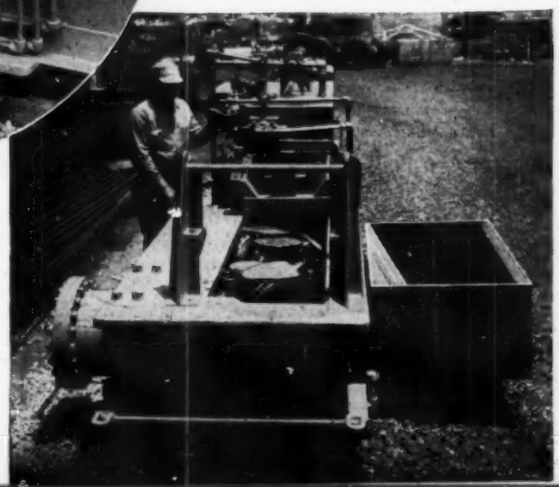
230-8 PARK AVENUE, NEW YORK 17, N. Y.

If you handle SCRAP METAL

-you need a DEMPSTER BALESTER

TRADE MARK REG.





Shown above, top, the Dempster-Balester, Model 125, complete with Diesel Powered Motor. Above, the Skip Pan Loader fills the charging box, note the compact space saving construction of the loader, and the simplicity of the hydraulic dumping mechanism. Right, front view of the Balester with charging box full and loading pan ready for reloading.

This compact Dempster-Balester, Model 125 portable press, handles any type of scrap metal, no pits or foundations necessary—just place it where needed and it's ready to deliver dependable service for you. Designed for rugged every day service, with all points of strain built oversize to withstand internal stresses beyond the normal need of baling. Charging box is squared and completely lined with abrasion plates with all high spots and toughness machined off. Powered by Electric Diesel or Gas Motors, the Dempster-Balester, equipped with the efficient Skip Pan Loader, is setting increased production records everywhere. Delivers a high density, 125 pound bale that is easily handled from baler to furnaces.

For heavier work and larger bales, investigate the Dempster-Balester Model 275. A powerful baling machine that delivers approximately 275 pound bales. Write or wire today for complete information.

DEMPSTER BROTHERS, INC., 2127 Higgins, Knoxville, Tenn.

HARTFORD SUPER-SPACER Special

for QUICK INDEXING

on Milling Drilling Grinding
Jig Boring Planing Slotting
Boring and other Operations

Illustrated is the Super-Spacer set up with drilling attachment. Flexibility of design allows for adjustment to various jobs within the range of the attachment. In this case the Super-Spacer permits quick-as-a-flash indexing on a job that calls for drilling spaced holes in a circular path. This is but one of the many time saving applications of the Super-Spacer. If your shop can use quick but accurate indexing, *write our Dept. S2.*

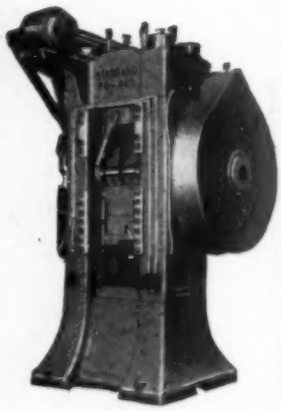
Hartford Special also makes the "Four-point" Milling Vise and the "V-Block" Fixture proven time and money savers on Milling, Boring, and Inspection Set-ups.

HARTFORD Special

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONN.

"Standard" POWER PRESSES

FOR LONG, PRODUCTIVE SERVICE



"Standard" Power Presses speed production operations—blanking, embossing, piercing, forming, drawing or assembling. Ruggedly made in several models—crank or knuckle style, direct or back geared, with solid or inclinable frame—to exactly meet your needs. "Standard" Power Presses and Foot Presses are world-known for their safety, long life and ability to produce.

Send for Bulletin PP.

STANDARD MACHINERY COMPANY
1565 ELMWOOD AVENUE, PROVIDENCE 7, R. I.

MANUFACTURERS OF
Power Presses to 500 Tons • Rolling Mills
Swagers • Turks Heads • Steel Die Sets

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

BAUMBACH *The* DIE SET AUTHORITY

All Baumbach Die Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

E. A. BAUMBACH MFG. CO., 1804 S. Kilbourn Ave., Chicago 23, Ill.

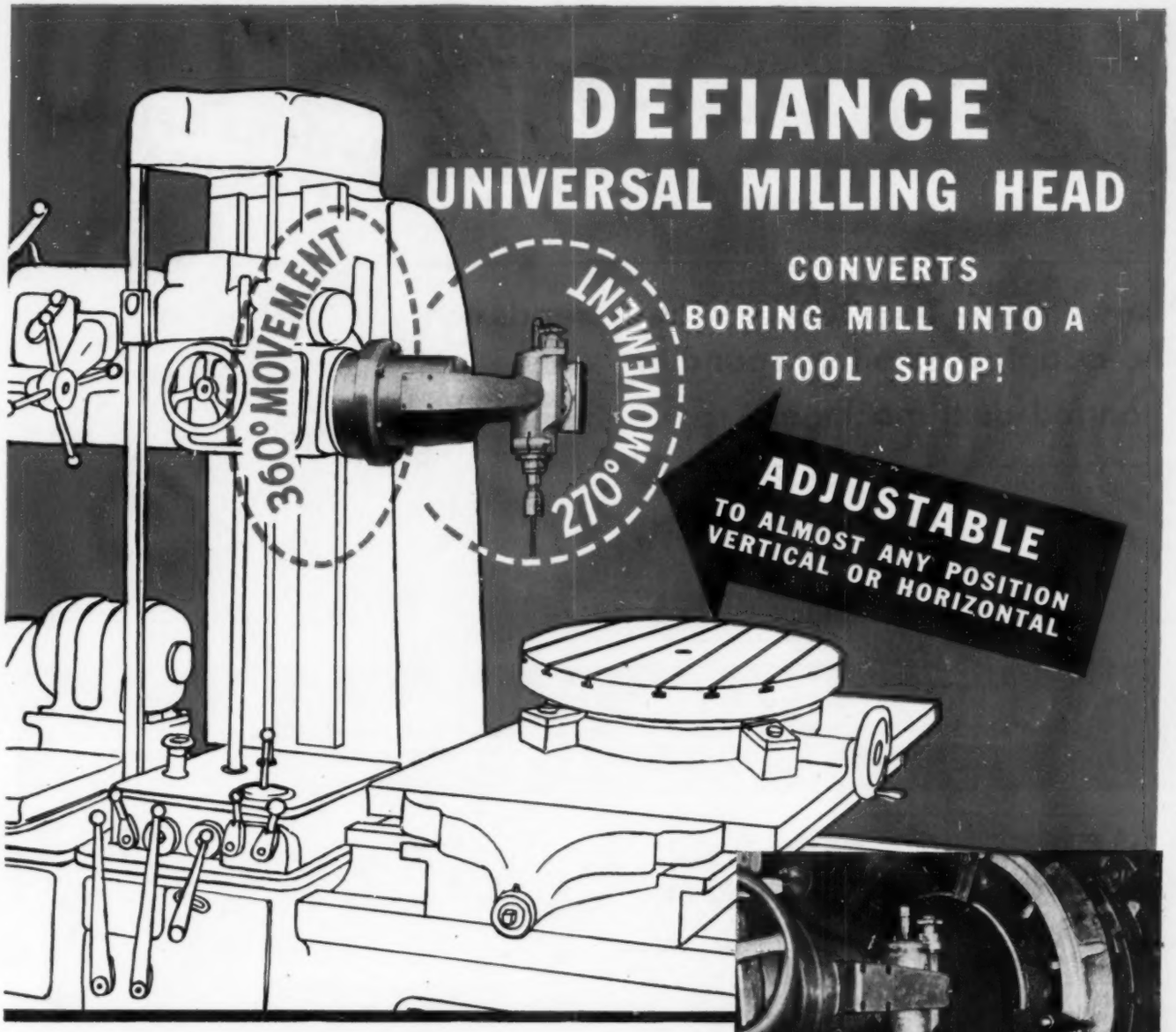
Put Your Stop Watch on NICHOLSON EXPANDING MANDRELS

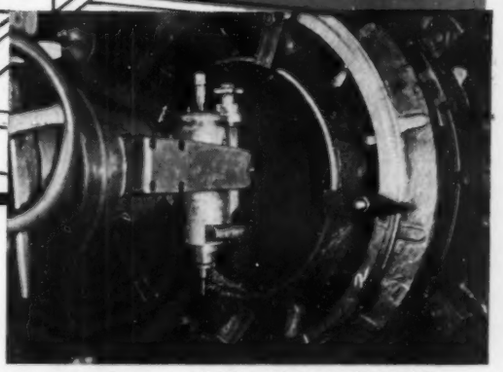
Test the time-saving possibilities of these widely used precision tools. Not infrequently time studies show operations can be completed in less time than was formerly consumed in looking for or turning a solid arbor. No parts to wear out and cause distortion. Sold singly or in sets; for bores ½" to 7" Bulletin 1043.

W.H.NICHOLSON & CO., 114 Oregon St., Wilkes-Barre, Pa.

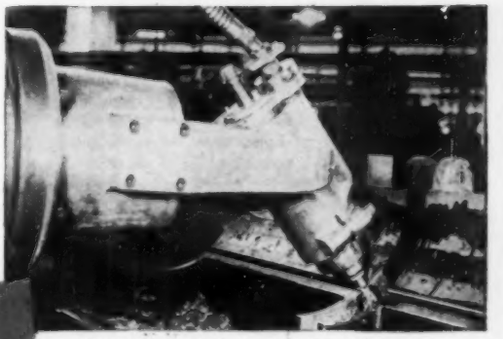
DEFIANCE
UNIVERSAL MILLING HEAD

CONVERTS
BORING MILL INTO A
TOOL SHOP!





A hard-to-get-at drilling job easily done with the universal milling and drilling head.



Milling an included angle slot with head set at 45°

Now—your Defiance Horizontal Boring Mill can do the work of a tool shop—with greatly increased flexibility made possible with a Defiance Universal Milling Attachment!

Handles precision boring, milling and drilling at almost any angle, vertical or horizontal, *in the original set-up*—saving time and labor and eliminating multiple set-ups. Can mill a flat face at any angle from 0° to 360° concentric with the spindle or from 0° to 270° at right angles or parallel to the spindle. Uses 2″ diam. facing cutter with 2½″ adjustment of its spindle sleeve. Sturdily constructed . . . Quickly and easily attached. Write for bulletin 847 . . . Defiance Machine Works, Inc., Defiance, Ohio.

DEFIANCE
BORING...MILLING...DRILLING...
TAPPING MACHINES

97 YEARS OF PRECISION MANUFACTURE

We'll stake our reputation on STANDARD Adjustable MULTIPLE SPINDLE DRILL HEADS

Low Prices • Top Quality • These Heads can be adapted on either round or flanged quill machines.

5 TYPES 56 SIZES

WRITE TODAY for 1948 catalog.

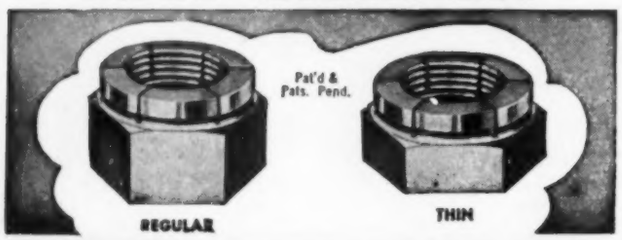
US HEADS SINCE 1915

Also manufacturers of all types of fixed center heads

UNITED STATES DRILL HEAD CO.

CINCINNATI 4, OHIO

FREE SAMPLES



FLEXLOC

SELF-LOCKING NUTS

"Flexloc" is of one-piece all-metal construction, available in U.S.S. and S.A.E. thread series. Every thread of the "Flexloc"—including the locking threads—takes its share of the load, and the torque is unusually uniform because it is controlled. "Flexloc" accommodates itself to a wide range of tolerances . . . can be used over and over again, without losing much of its locking torque . . . is not affected by temperatures likely to be met within the field of Mechanical Engineering . . . being a "stop" nut, it *stays locked* in any position on the threaded member.

It is made by the manufacturers of the unexcelled "Unbrako" Socket Screw Products—guaranteeing quality. Sizes from #6 to 1" in diameter—in both "regular" and "thin" types (shown above).

Millions of Flexlocs now in use.

OVER 44 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PA. BOX 4

BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

H&G DIE HEAD

See our Advt. on Page 209 Nov. 6, '47 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.

Los Angeles: *A. C. Behringer, 524 N. San Pedro St., San Francisco: Guy Reynolds, 484 Vernon St., Oakland,* Canada: *F. Barber Machinery Co., Toronto, Canada.*

PRESSES
FEEDS
AUTOMATIC EQUIPMENT

THE V & O Press Co.

HUDSON N. Y.

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

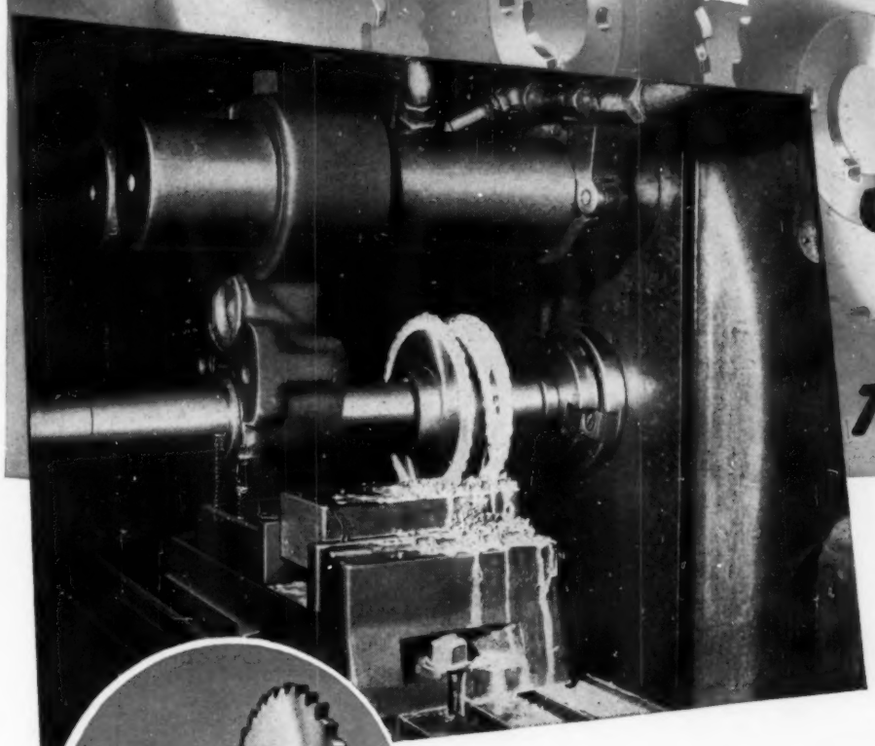
THE GRANT MFG. & MACHINE CO.

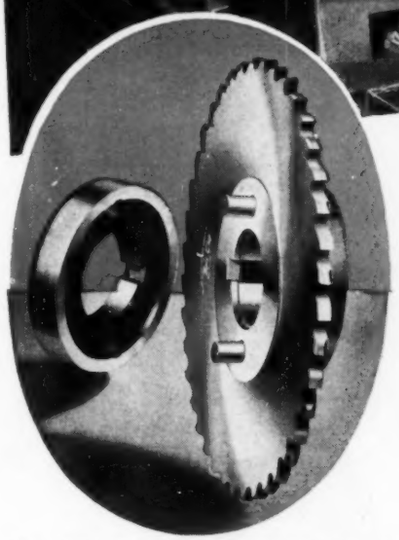
85 Silliman Ave., Bridgeport, Conn., U. S. A.

Here Come MOTCH & MERRYWEATHER *Slitting Saw Blades* for Milling Applications

... WITH WELL KNOWN TRIPLE-CHIP EFFICIENCY *and-*

3 Other Big Advantages





The Motch & Merryweather Dual Drive design, eliminating saw blade keyway drive, adds driving power and prevents breakage from keyway.

DUAL DRIVE ADAPTATION

•

RANGE OF PITCH

•

INTERCHANGEABILITY

Motch & Merryweather Slitting Saw Blades bring you all the advantages of Triple-Chip cutting: record-breaking speeds, low cost operation, long life, inexpensive sharpening. *Also, dual drive pin construction,* which provides positive driving properties, eliminating blade breakage caused by the former keyway drive. *Also, range of pitch,* in that three standard tooth spacings in all diameters and thicknesses permit selection to fit various types of work. *Also, interchangeability,* since standard size center hole and dual drive enable blades to fit 1¼" diameter arbors or smaller, thus reducing your blade inventory. Other proven features, too, make Motch & Merryweather Slitting Saw Blades worthy members of the widely known Triple-Chip line.

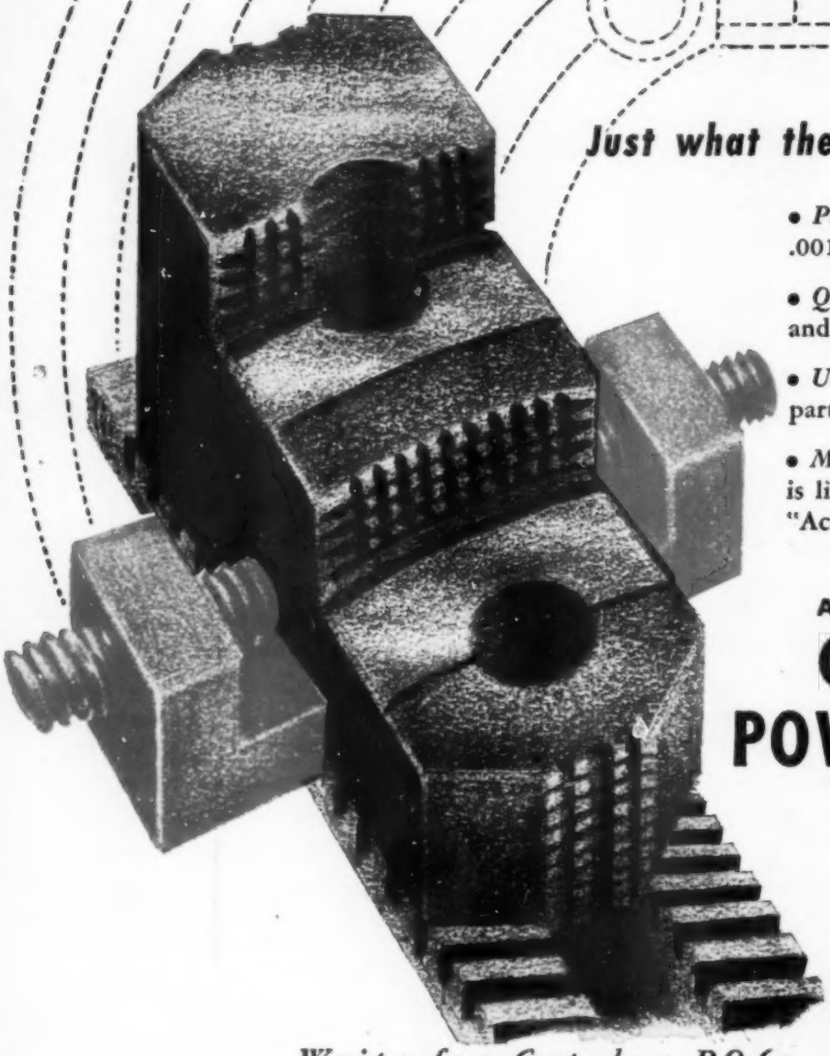
Get the whole story in our Bulletin A-12, just off the press.

THE MOTCH & MERRYWEATHER MACHINERY CO.

PENTON BUILDING · CLEVELAND 13, OHIO

CUTTING TOOL DIVISION

CUSHMAN "ACCRALOCK"



Just what the name implies

- *Precision* in jaw adjustment to within .001" concentricity.
- *Quick, positive lock* with the safety and rigidity of a solid jaw.
- *Utmost simplicity* with few sturdy parts.
- *Maintained accuracy* because there is little or no wear in operation of "Accralock" units.

An exclusive feature of

CUSHMAN POWER CHUCKS

Write for Catalog PO62

THE CUSHMAN CHUCK COMPANY, HARTFORD 2, CONNECTICUT

PROVED

CLEARING S SERIES PRESSES DOUBLE CRANK—WELDED STEEL

This Clearing series is new, but by no means untried. Clearing presses of S Series have been performing, in actual routine production, in different plants and in sufficient numbers to prove their merits beyond question.

Being crankshaft driven, these presses are naturally less costly than the eccentric presses for which Clearing is so well known. However, the welded steel construction—pioneered by Clearing years ago—the long, adjustable and removable gibs, the barrel-type slide adjustment, and other features mark the Clearing S Series, as something far beyond the ordinary crankshaft press. Capacities from 60 tons, bed widths from 36″. Details are yours for the asking.

MECHANICAL AND HYDRAULIC PRESSES • 35 TONS CAPACITY AND LARGER

CLEARING

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION
6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS

Have YOU tried the CARBOLOY® dresser with "EDUCATED DIAMONDS"

THEY CAN'T COME LOOSE! THEY STAND ABUSE!

"Educated" is the word for the diamonds in the Carboloy Dresser. They know their job and STAY right with it.

Here's a diamond dresser with lots of diamonds that just *can't* come loose—stand abuse—need no remounting. No diamonds to lose—they're permanently impregnated in a special carbide matrix.

Operators and management *both* like the Carboloy Dresser because it gives more satisfaction and more savings. It permits faster traverse speeds—saves up to 40% in dressing costs. It gives better quality dressings—quicker and easier.

For diamond dressing silicon carbide and aluminum oxide wheels.

#2B	#3C	#4D
$11.90	$15.65	$19.00

Available in 8 Standard Mountings and Hand Dresser. Send for new free booklet No. DR-103

CARBOLOY®

DIAMOND DRESSERS

Tear Out and MAIL!

CARBOLOY CO., INC.
11149 E. 8 Mile Street, Detroit 32, Michigan
Send me free booklet showing how Carboloy DIAMOND Dressers save up to 40% and give greater satisfaction.

NAME_____
ADDRESS_____ ZONE____ STATE____
CITY_____

FIRST choice for tough jobs—

haskins

There's no job too rugged . . . no hours too long, for Haskins Flexible Shaft Machines.

If your operation calls for grinding rough castings or heavy weldings, for large sanding jobs, or for heavy scratch brush work, you can find a Haskins machine to do the job—*and keep on doing it for years!*

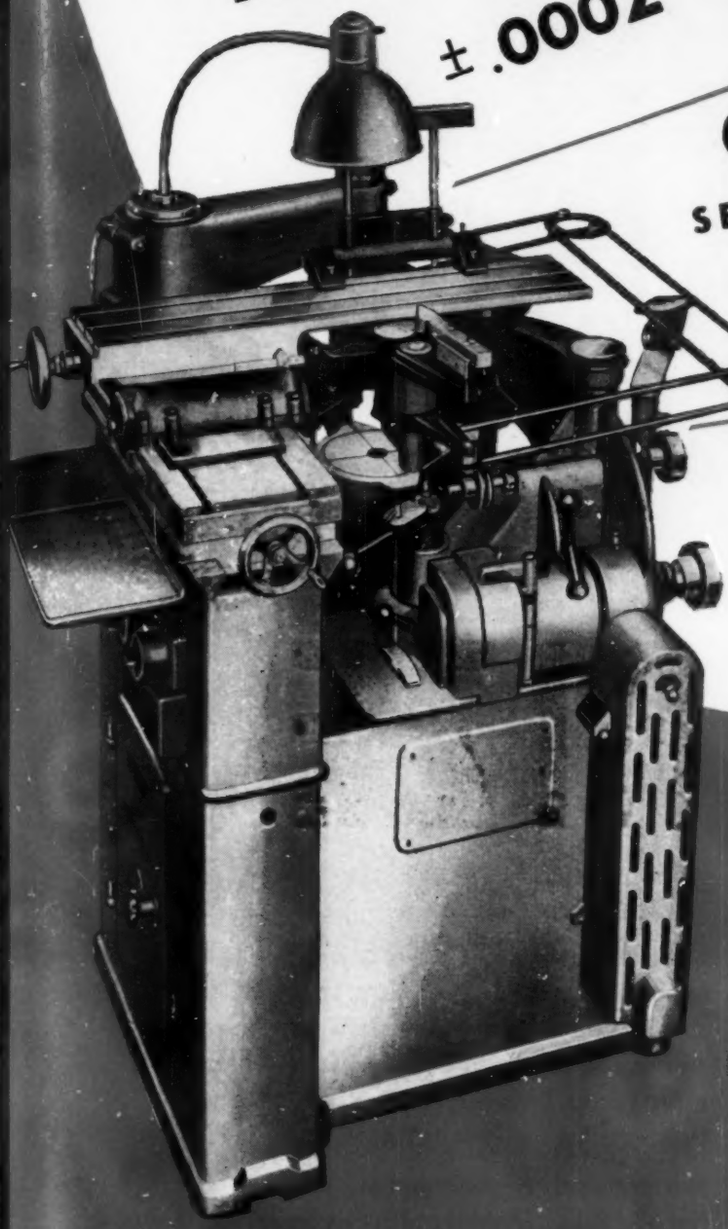
Not only for heavy duty but also for more precise work, you'll find that Haskins tools are unequalled for long, excellent service. There's a Haskins machine to help your shop. Write for details to **R. G. Haskins Company, 2641 W. Harrison St., Chicago 12, Illinois.**

HASKINS

H-6, ½ h.p. multi-speed, Timken bearing countershaft, 825 to 3400 R.P.M., mounted bench height pedestal (as illustrated) or low pedestal, 360° swivel.

haskins

FLEXIBLE SHAFT EQUIPMENT



ACCURATE TO ±.0002"

GRINDS
SECTIONAL DIES
FLAT FORM TOOLS
CIRCULAR TOOLS
GAGES, ETC.

IDEAL FOR GRINDING
TUNGSTEN CARBIDE
USING DIAMOND WHEELS

TYPE PSM

STUDER
PROFILE GRINDER

Get accuracy to ± .0002" on work up to 6" in length . . . on complete 360° contours up to 4" in diameter . . . on pieces up to 2" in thickness. Grind tungsten carbide tools to any shape, using diamond wheels. Eliminate preliminary grinding to form on many small parts. The speed, versatility and typical Swiss precision of the Studer Profile Grinder have made it the choice of the best-equipped tool rooms all over the world.

COSA

COSA

CORPORATION
CHRYSLER BUILDING
NEW YORK 17, N. Y.

COSA CORP., Chrysler Building, New York 17, N. Y. AM

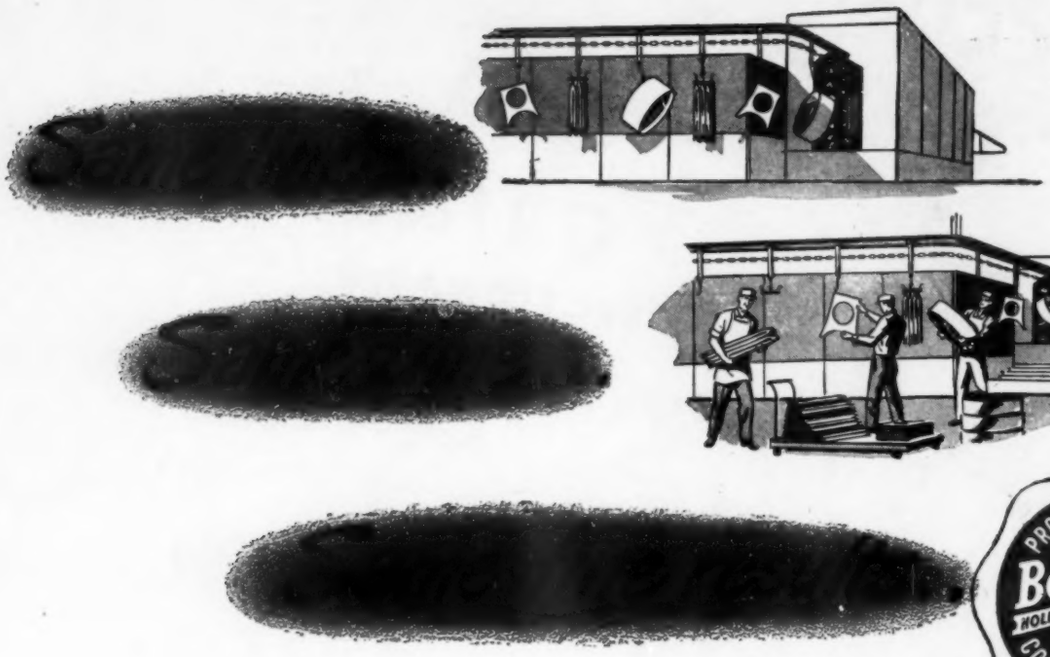
Send one of your engineers to discuss how the Studer Profile Grinder can be applied to my specific job requirements.

Name .....

Company .....

Street and No. .....

City ..... Zone ..... State .....



PROTECTED BY Bonderite HOLDS PAINT TO METAL FOR CORROSION RESISTANCE

BONDERIZE

Steel, Zinc, Aluminum!

Steel, zinc, aluminum, and their alloys—in sheet metal or in castings—can now be Bonderized with the same process and at the same time. For manufacturers with mixed metal production, here is added manufacturing efficiency and production economy.

On all these metals, the Bonderizing treatment converts the surface to a tight, nonmetallic crystalline phosphate coating which forms a secure anchor for paint, inhibits rust and corrosion, and promotes lasting fine appearance. Now your product can have the same effective fine finish protection used on automobiles, refrigerators, home freezers, and other products that emphasize lasting beauty.

Bonderizing is economical, simple, and dependable. Investigate this sales and performance feature now!

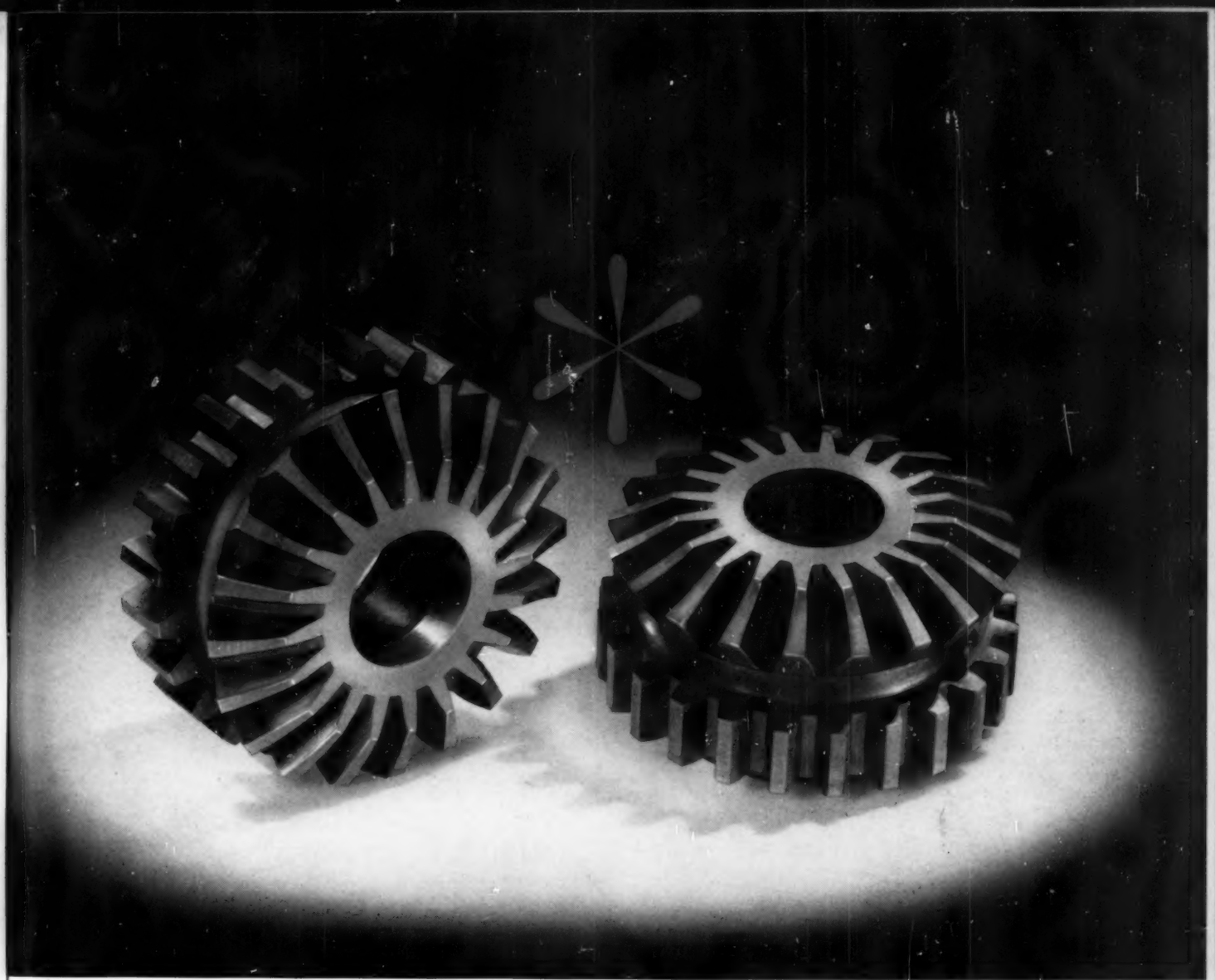
SEND FOR FREE TECHNICAL BULLETIN

Full information! Write today for your copy of technical bulletin on Bonderizing for mixed production!

PARKER RUST PROOF COMPANY, 2196 East Milwaukee Ave., Detroit 11, Michigan

BONDERIZING Holds Paint to Metal — PARKER PROCESSES — **PARKERIZING** Inhibits Rust — PARKER PROCESSES — **PARCO LUBRIZING** Retards Wear on Friction Surfaces

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.



* Can One gear do the work of Two?

***In this case**, the answer was an emphatic "Yes!"*

Although two gears could do the work and do it well, an integral spur and bevel does it better.

This design, shown in two views above, trims costs, simplifies assembly, increases strength and rigidity, reduces noise, and does an all-around better job.

Perhaps *your* gear problem can benefit by engineering foresight and imagination of this kind. Perhaps *your* product, whatever it may be, will benefit by the unvarying standards of gear manufacture adopted more than twenty-five years ago and zealously followed ever since. Perhaps *your* customer—the man for whom both of us are working—will enjoy an added measure of satisfaction because, somewhere in your product, Double Diamond Gears are doing so well the work they were carefully designed and built to do.

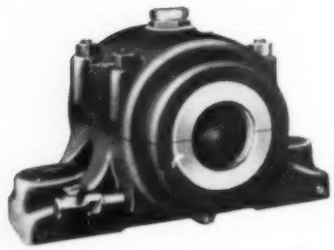
Aren't these possibilities worth considering? If you agree, Double Diamond engineers can get to work at once—either on your own specifications or on ones prepared by us to meet the standards you require. A letter is all that's necessary to get the project started.

DOUBLE DIAMOND
TRADE MARK
GEARS

Made by
Automotive Gear Works, Inc.
RICHMOND, INDIANA

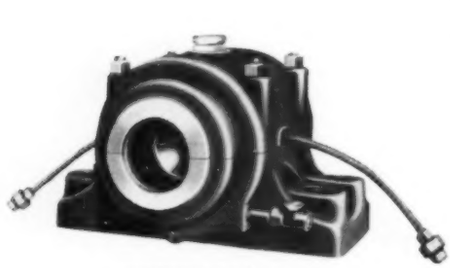
FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

FAN AND BLOWER BEARINGS



SLEEVOIL PILLOW BLOCK

A precision-built, ring-oiling babbitted bearing, self-aligning and exceptionally quiet. Special seals prevent oil leakage and keep dirt out. Field-proved by thousands of installations.



WATER-COOLED SLEEVOIL PILLOW BLOCK

Designed for applications where higher temperatures are encountered. Shaft sizes from 1-11/16" to 8". Widely used under industry's toughest operating conditions.

DH BALL BEARING FAN AND BLOWER PILLOW BLOCK

Single row, deep groove ball bearings for No. 2 arrangement. Inner race extended to form sleeve which carries shaft. Piston ring seals retain lubricant, exclude dirt. Shaft sizes 15/16" to 2-1/4". A favorite where compactness is at a premium.

BRONZOIL PILLOW BLOCK

Capillary bronze bushing has capacity of one-third its volume in oil. Reservoir with close fitting wick around bushing provides ample lubrication. Oil resistant and static proof grommets available for noise isolation. Sizes 1/2" to 1-1/4". America's standard for light applications.

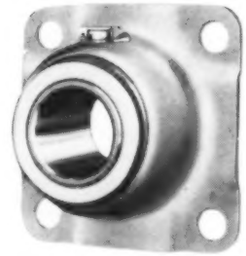
America's Most Complete Line

Working closely with air conditioning equipment manufacturers, Dodge of Mishawaka has developed bearings to meet the exacting operating conditions encountered in this industry. Cost-saving products for the mechanical transmission of power are manufactured by Dodge for use in all industries.

DODGE MANUFACTURING CORPORATION • MISHAWAKA, INDIANA

DODGE

of Mishawaka, Ind.



BRONZOIL FLANGED BEARING

Mounted in heavy gauge steel flanged housing this bearing has the basic Bronzoil construction and characteristics as described at the left. Sizes 1/2" to 1-1/4". A proven performer in a new mounting.

CALL THE TRANSMISSIONEER

your local Dodge distributor, for information about the line of Dodge bearings for fan and blower service—and for news about Dodge products to cut costs and increase production in all industries. Look for his name under "Power Transmission Equipment" in your classified phone directory.

Copyright, 1947, Dodge Mfg. Corp.

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

FREE LITERATURE

New Catalogs, Booklets, Bulletins

MACHINES AND ATTACHMENTS

1 GRINDERS—Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. Two 8-page bulletins describe 26-in. vertical hydraulic gear grinder and No. 2C all-electric jig grinder which will grind holes to 5-in. dia.

2 INTERNAL FINISHER—Abrasive Machine Tool Co., East Providence 14, R. I. 4-page bulletin on No. 5 AWF internal finisher, a carbide-finishing machine designed for multiple-angle grinding in one setup. Also available is 4-page bulletin on Model GC circular-graduating machine.

3 CONTOUR GRINDING — Porter-Cable Machine Co., Syracuse 8, N. Y. 8-page bulletin covers C-6 belt grinder-polisher for contoured and straight-faced grinding. Also available is 4-page bulletin on wet-or-dry belt centerless grinder Type L-4.

4 HYDRAULIC PRESSES—Air-Hydrulics, Inc. New York 13, N. Y. 12-page bulletin describes and illustrates various types of presses available, their accessories and uses. Pictures show 28 jobs actually done.

5 GRINDERS—Gallmeyer & Livingston Co., Grand Rapids 4, Mich. 12-page bulletin describes line of grinders including hydraulic-feed surface grinders, universal cutter and tool grinders, combination drill and tap grinders.

6 DRILLS—Canedy-Otto Mfg. Co., Chicago Heights, Ill. 16-page bulletin 90 describes equipment including 21- and 16-in. single- and multiple-spindle floor drills; 18-in. Royal bench and floor drills; radial drills and other units.

7 CIRCULAR SAWING—The Motch & Merryweather Machinery Co., Cleveland, Ohio. 16-page bulletin covers line of circular-sawing machines which employ "Triple-Chip" method. Also two 12-page bulletins on Nos. 00 and 2 circular-sawing machines.

8 LATHES—Logan Engineering Co., Chicago 30, Ill. 12-page bulletin on lathes including quick-change-gear cabinet lathe, several types of turret lathes, and screw-cutting machines. Also describes 7-in. shaper.

9 TAP SHARPENING—Edward Blake Co., Newton Centre 59, Mass. 8-page bulletin 647 describes precision tap sharpening on the Blake flute grinder. Includes three pages of settings for two-, three- and four-flute taps.

10 GRINDERS—Boyar-Schultz Corp., Chicago 12, Ill. Four 2-page bulletins describe and illsustrate Nos. 1 and 2 profile grinders; and Nos. 618 and 612 surface grinders with rated capacities of 6x18- and 6x12-in. respectively.

11 WASHING MACHINES — G. S. Blakeslee & Co., Chicago 50, Ill. 28-page bulletin describes washing machines for metal parts. Various types include spray washers, spiral-type washers, scoop-type spiral washers, and paddle-wheel units.

12 BROACHING—Americn Broach & Machine Co., Div. Sundstrand Machine Tool Co., Ann Arbor, Mich. 12-page circular 33 describes single-ram, single-dual and duplex surface broaching machines. Contains photographs of actual operations.

13 GRINDERS—Covel Mfg. Co., Benton Harbor, Mich. 6-page bulletin 5-47 includes Models 12 and 22 universal cutter and tool grinders, Models 12 and 22 grinding heads for carbide tools, No. 20 surface grinder, and other units.

14 FACE-MILL GRINDER—Oliver Instrument Co., Adrian, Mich. 8-page bulletin covers "ARC" and "Automatic" face-mill grinders. Sharpening is done by one continuous movement of the grinding wheel.

15 CARBIDE MILLING—The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. 20-page booklet, "Recommendations for Carbide Milling," includes speeds, feeds, cutter angles, methods and other information for carbide milling of steel and cast iron. Also available is 12-page booklet, "Recommendations for Grinding Carbide Milling Cutters."

TOOLS AND ACCESSORIES

16 GRINDING WHEELS—A. P. de Sanno & Son, Inc., Phoenixville, Pa. 36-page handbook lists Radiac grinding wheels according to manufacturing process (silicate, vitrified, resinoid, rubber and shellac). Under each of these classes it gives type of abrasive, grain sizes, grade and bond.

17 TAPS AND DIES—The Charles L. Jarvis Co., Middletown, Conn. 12-page catalog JDT1 describes Jarvis-Dowding taps and dies made in the Dowding Co. plant recently acquired by Jarvis. Gives specifications of all units.

18 TESTING, MEASURING — Apparatus Dept., General Electric Co., Schenectady 5, N. Y. 44-page catalog of specialized testing and measuring equipment includes magnetic, time, speed and torque equipment, materials testers and many other units.

19 CUTTING TOOLS — Illinois Tool Works, Chicago 39, Ill. 42-page stock list of metal-cutting tools includes hobs, slitting saws, milling cutters, keyseat cutters, toolbits, concave and convex cutters.

20 BORING HEAD—Moline Tool Co., Moline, Ill. 4-page bulletin on an automatic retracting boring head which provides micrometer adjustment of tungsten-carbide-tipped toolbit. Unit is said to prevent tool drag during withdrawal.

21 HAND MILLER—H. B. Rouse & Co., Chicago 14, Ill. Five 2-page bulletins describe hand miller; fixture setups and coolant pan for the miller; and work performed. Unit has ¼-hp. motor, handles light cuts in brass, aluminum and similar metals.

22 BRUSHES—The Osborn Mfg. Co., Cleveland 14, Ohio. 76-page catalog presents complete line of wire and fibre wheel brushes, paint and varnish brushes and maintenance brushes. Illustrates actual operations.

23 REAMING TOOLS—Madison Mfg. Co., Muskegon, Mich. 34-page catalog on adjustable reamers and bars for any type of job. Illustrates special applications and gives information on how to grind the cutters.

Example

Name. John Roderick.....
Title. Supt.....
Company W.C. Dow Mfg. Co..
Co. Address 601 North St....
Brooklyn, 7, N.Y.....
AMERICAN MACHINIST, New York

Fill in below number of ONE catalog wanted: (32)

How to Order

1. If you are requesting four pieces or less, please use only the bottom card.
2. Be sure to fill one space for each booklet.
3. When you have filled out one card, detach, stamp and mail.

(Not good after February 1, 1948)

Name.....
Title.....
Company.....
Co. Address.....
.....
AMERICAN MACHINIST, New York 12-18

Fill in below number of ONE catalog wanted: ( )

Name.....
Title.....
Company.....
Co. Address.....
.....
AMERICAN MACHINIST, New York 12-18

Fill in below number of ONE catalog wanted: ( )

Name.....
Title.....
Company.....
Co. Address.....
.....
AMERICAN MACHINIST, New York 12-18

Fill in below number of ONE catalog wanted: ( )

Name.....
Title.....
Company.....
Co. Address.....
.....
AMERICAN MACHINIST, New York 12-18

Fill in below number of ONE catalog wanted: ( )

Name.....
Title.....
Company.....
Co. Address.....
.....
AMERICAN MACHINIST, New York 12-18

Fill in below number of ONE catalog wanted: ( )

Name.....
Title.....
Company.....
Co. Address.....
.....
AMERICAN MACHINIST, New York 12-18

Fill in below number of ONE catalog wanted: ( )

Name.....
Title.....
Company.....
Co. Address.....
.....
AMERICAN MACHINIST, New York 12-18

Fill in below number of ONE catalog wanted: ( )

FREE LITERATURE

AMERICAN MACHINIST
330 West 42nd Street
New York 18, N.Y.

Place 3¢ Stamp Here

AMERICAN MACHINIST
330 West 42nd Street
New York 18, N.Y.

Place 3¢ Stamp Here

24 FLUORESCENT PENETRANT—Magnaflux Corp., Chicago 31, Ill. 8-page bulletin describes Zyglo penetrant, which is used to detect surface flaws in solid materials. Applied by brush, spray or dip, Zyglo carries fluorescent material into cracks, is then observed under black light.

25 FLEXIBLE SHAFTS — N. A. Strand & Co., Chicago 40, Ill. 32-page catalog 30 on flexible shafts and machines for operations such as grinding, sanding, drilling, nut setting. Includes 13 pages of attachments and cutters.

HEAT-TREATING AND WELDING

26 HEAT FOR METALS — Surface Combustion Corp., Toledo 1, Ohio. 32-page booklet, "Heat for Metals," describes designing and manufacturing of heating equipment for metal producing and working. Includes history of development of gas chemistry and heat-treatment.

27 OIL COOLERS—Bell & Gossett Co., Morton Grove, Ill. 24-page bulletin OC-743 on rapid oil coolers and heat-transfer equipment. Includes description of controlled-quench oil-cooling method.

28 ELECTRODES, TIPS, HOLDERS —Weiger Weed & Co., Div. Fansteel Metallurgical Corp., Detroit 4, Mich. 24-page booklet on resistance-welding materials including replaceable tips, water-cooled holders, seam-welding wheels, dies, electrodes and refractory alloys.

PLANT SERVICE EQUIPMENT

29 STEEL SHELVING—Equipto Div., Aurora Equipment Co., Aurora, Ill. 16-page catalog 461 includes steel shelving, bin units, drawer units, stock carts, workbenches, tooltoters and toolroom units.

30 PRECISION EQUIPMENT — The Challenge Machinery Co., Grand Haven, Mich. 16-page catalog 836 includes layout surface plates, reading tables, workbenches, lapping and bench plates, angle plates and other equipment of a similar nature.

31 THE COMMON COLD—Benson Laboratories, Inc., Pittsburgh 22, Pa. Folder describes formula A-N-1, a product for industrial and business firms to reduce employe absences due to colds. Used only when cold is present.

32 ELECTRIC TRUCKS — Automatic Transportation Co., Chicago 20, Ill. 8-page catalog describes Transtackers, Transporters, Skylifts and other Automatic electric trucks. One page illustrates various attachments to increase versatility of tiering fork trucks.

33 BASKETS, TRAYS, FIXTURES—Stanwood Corp., Chicago 39, Ill. 16-page catalog 16 on fabricated metal products for handling material through heat-treating, quenching, pickling, degreasing. Includes baskets, trays, fixtures, retorts, carburizing boxes.

PARTS AND MATERIALS

34 WORM GEARING — De Laval Steam Turbine Co., Trenton 2, N. J. 48-page catalog describes advantages of worm gearing. Gives service classifications, bearing-load formulas, hp. ratings, and dimensions of worms, mountings, gears and standard flanged rims.

35 FITTINGS—Gedney Electric Co., New York 20, N. Y. 62-page tabulated catalog includes conduit and EMT fittings, box connectors, entrance and ground fittings, conduit bodies and EMT bodies, and similar products.

36 CLAMPS—Marman Products Co., Inc., Inglewood, Calif. 20-page catalog describes clamps for standard and special applications. Standard types include universal, T-bolt, quick-coupler and multiple take-up clamps.

37 SHEAVES—American Gear & Mfg. Co., Chicago 50, Ill. 16-page catalog on White-Line V-belt sheaves includes A, B, C, D, and E standard-groove sheaves. Includes 6-page price list (which also prices standard V-belts).

38 AXIAL AIR GAP — Fairbanks, Morse & Co., Chicago 5, Ill. 16-page bulletin covers Axial Air Gap motor, in which the air gap is measured parallel to the shaft axis. Unit is said to be one-half as large and 30% lighter than conventional units of same rating.

39 HYDRAULIC CYLINDERS—Hannifin Corp., Chicago 24, Ill. 52-page bulletin 110 covers double-acting hydraulic cylinder made in sizes from 1- to 8-in. bore, in capacities to 75,000 lb., and in 11 standard models.

40 LUBRICANT SAMPLES—Chicago Mfg. & Distributing Co., Chicago 9, Ill. Sample kit contains two ½-oz. tubes of Anti-Scoring lubricants: center-point oil and center-point lube No. 3 (grease) form.

41 TUBING—Superior Tube Co., Norristown, Pa. 16-page catalog section 10 on nickel and nickel-alloy small tubing from 0.010- to ½-in. O.D. Data gives characteristics of nickel, Monel, "K" Monel, Inconel and Cupro-nickel.

42 TEXROPE DRIVES — Allis-Chalmers, Milwaukee 1, Wis. 144-page indexed catalog for "pre-engineered" Texrope Drives. More than 22,000 of these V-belt stock drives are listed in two-thirds of the book. Also describes new Magic-Grip sheave sizes.

43 ARMASTEEL — Central Foundry Div., General Motors Corp., Saginaw, Mich. 38-page bulletin describes ArmaSteel, a cast ferrous metal said to have the strength of forgings. Gives properties, application data and recommendations.

44 PACKINGS—E. F. Houghton & Co., Philadelphia 33, Pa. 112-page handbook on synthetic-rubber packings. Gives information on application and design of all types, both fabricated and homogeneous.

45 PYRASTEEL—Chicago Steel Foundry Co., Chicago, Ill. 16-page bulletin describes properties and applications of Pyrasteel heat-resisting steel castings. Illustrates typical finished products. Also available is 8-page bulletin on Evansteel, a nickel-chrome-molybdenum alloy.

46 CAST ALLOY—The International Nickel Co., Inc., New York 5, N. Y. 36-page bulletin covers physical properties and applications of Ni-Resist, a group of high-nickel-alloy cast irons. Includes 13 pages of corrosion-data tables.

47 FLEXIBLE HOSE — Resistoflex Corp., Belleville 9, N. J. 8-page bulletin describes flexible hoses made of Compar, a group of rubber-like materials said to have five to 20 times the wear resistance of natural rubber.

48 BALL BEARINGS—Jack & Heintz Precision Industries, Inc., Cleveland 1, Ohio. 18-page catalog 2001 on ball bearings includes a pictorial section devoted to J & H precision ball-bearing production methods. Includes bearing specifications and equivalents.

49 STEEL BELLOWS—Chicago Metal Hose Corp., Maywood, Ill. 12-page bulletin covers stainless-steel bellows designed to withstand elevated temperatures and corrosion. Strength can be enhanced with multiple-ply assemblies.

50 PUMP ENGINEERING — Pioneer Pump & Mfg. Co., Detroit 3, Mich. 88-page engineering manual on Pioneer and Rollway coolant and lubricant pumps. Book is designed to help reader avoid lengthy calculations and formulas when selecting proper pump.

MISCELLANEOUS

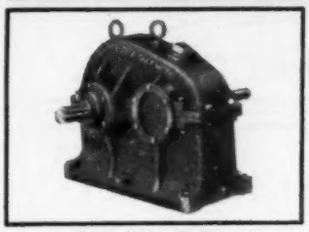
51 AERONAUTICA—Air Express Div., Railway Express Agency, Inc., New York 17, N. Y. Entertaining 16-page booklet, "An Aeronautica of Air Express," contains drawings and prints showing early conceptions of air travel and cargo, and also has some later photos showing how air express developed.

52 THE STORY—Mullins Mfg. Corp., Warren, Ohio. 80-page book celebrates 75th anniversary of the firm. Tells how W. H. Mullins Co. and Youngstown Pressed Steel Co. grew, merged and became a three-plant industry. Tells story from viewpoint of people, leaving machines alone for a change.

53 WHAT WOULD YOU DO?—Associated Factory Mutual Fire Insurance Cos., Boston 10, Mass. 12-page booklet, "Watchman, What Would You Do?", uses cartoons and question-and-answer method to drive home points on what to do when a fire starts.

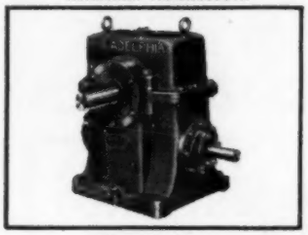
THESE PHILLIE GEAR REPRESENTATIVES

are always ready to help you . . .

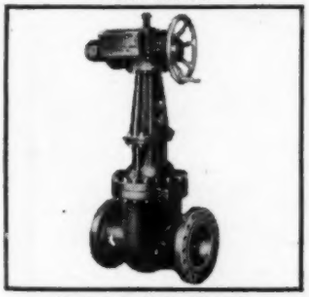


Herringbone Reducer

Horizontal MotoReduceR



Worm Reducer



Limitorque Valve Operator

DISTRICT SALES OFFICES

Chicago, Illinois — 111 West Washington St.
New York 18, N. Y. — 330 W. 42nd Street
Pittsburgh, Pa. — 418 Frick Building

SALES REPRESENTATIVES

AKRON, OHIO
John F. Beese
Akron Savings and Loan Bldg.

ATLANTA, GEORGIA
A. J. Kroog
902 West College Avenue
Decatur, Georgia

BOSTON, MASS.
Mills Engineering Company
10 High Street

BUFFALO, NEW YORK
H. E. Sundberg
Ellicott Square Building

CHICAGO, ILLINOIS
Philadelphia Gear Works, Inc.
A. R. Herbert, Manager
111 West Washington Street

CHICAGO, ILLINOIS
H. J. Kaufman
20 North Wacker Drive
(Limitorque only)

CLEVELAND 3, OHIO
J. D. Ingram
4500 Euclid Avenue

DALLAS 2, TEXAS
Lynn Elliott Company
Mr. Walter Lightbourn
6A—2nd Unit Santa Fe Bldg.

DETROIT, MICHIGAN
L. L. Handy
6432 Cass Avenue

HOUSTON, TEXAS
Lynn Elliott Company
322 M & M Building

INDIANAPOLIS, INDIANA
A. R. Young
635 North Pennsylvania Street

KANSAS CITY, MISSOURI
W. R. Fithian Company
B. M. A. Building
215 Pershing Road

KANSAS CITY, MISSOURI
L. C. Pensinger & Son
1332 Oak Street
(Limitorque only)

LOS ANGELES 21, CALIFORNIA
L. F. Atwood
931 Santa Fe Avenue

MILWAUKEE, WISCONSIN
Roy C. Kendall
437 Commerce Building
744 North Fourth Street

MINNEAPOLIS, MINNESOTA
F. M. Giefer
2644 - 34th Avenue South

NEW ORLEANS 18, LA.
Walter B. Moses, Jr.
7836 Saint Charles Avenue

NEW YORK 18, NEW YORK
Philadelphia Gear Works, Inc.
Mr. J. K. Rewalt, Manager
330 West 42nd Street

NEWARK, NEW JERSEY
C. W. Ludlow
572 Highland Avenue

NORFOLK 10, VIRGINIA
R. T. Overstreet
522 Wainwright Building

OAKLAND 7, CALIFORNIA
P. E. Haultain
239-241 12th Street

PITTSBURGH, PENNSYLVANIA
Philadelphia Gear Works, Inc.
Mr. George Nairn, Jr., Manager
418 Frick Building
5th Avenue and Grant Street

PITTSBURGH, PENNSYLVANIA
Herr-Harris Company
Room 1101—545 Wm. Penn Way
(Limitorque only)

PORTLAND, OREGON
W. G. Ballantyne Company
1215 N. W. Everett Street

ST. LOUIS, MISSOURI
Kingsley Davey
713 Ambassador Building
411 North 7th Street

SAN FRANCISCO, CALIFORNIA
Merrill Company
Hobart Building
582 Market Street
(Limitorque only)

SEATTLE, WASHINGTON
W. G. Ballantyne Company
S. F. Patterson
1717 West Austin Street

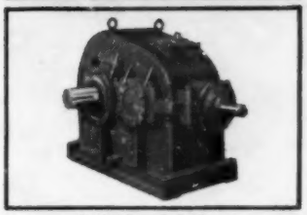
SYRACUSE, NEW YORK
Uplinger and Sherman Inc.
600-604 South West Street

TULSA, OKLAHOMA
H. A. Rogers
717 Daniel Bldg.

•

TORONTO, ONTARIO, CANADA
William & J. G. Greey Ltd.
56 Esplanade Street

SAGUA LA GRANDE, CUBA
Fundicion Macfarland, S. A.



Spiral-Bevel Reducer

Planetary—Single Reductions

"AirKooled" Worm Reducer

Vertical MotoReduceR

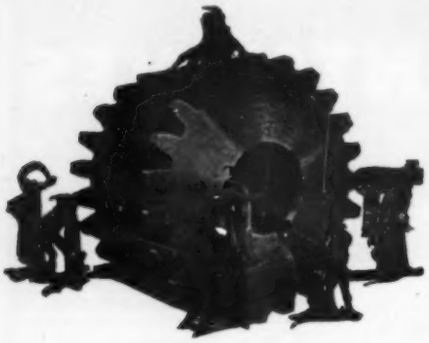
. . . they're a vital part of "Phillie Gear's" nationwide service to Industry.

Philadelphia GEAR WORKS INCORPORATED

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO . . . IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls



GANSCHOW

CUT GEARS ALL TYPES

Better Gear Products

GANSCHOW GEAR CO., 14 N. Morgan Street, CHICAGO 7.

D.O.James

GEARS For INDUSTRY

SINCE 1888 . . . We have been making many types and sizes of gears for industry. Vast plant facilities of the most modern gear cutting equipment assure capable handling of your *production* or *special* gear requirements.

HELICAL and BEVEL GEARS—From 1" to 60" in diameter and from 24 DP to 1½ DP.
SPUR GEARS—Size range from ¾" to 150" in diameter. 32 DP to ¾ DP.
HERRINGBONE GEARS—Made from 1" to 60" in diameter and from 10 DP to 1½ DP.
SPIRAL BEVEL GEARS—Made from 1" to 30" in diam. and 24 DP to 1½ DP.
WORM GEARS—Made from 1" to 100" in diam. and from 24 DP to 1 DP.

YOUR GEAR INQUIRIES WILL RECEIVE IMMEDIATE ATTENTION
D.O. JAMES GEAR MANUFACTURING COMPANY
1140 W. MONROE ST. • CHICAGO 7, ILL.

GEARS SPURS, SPROCKETS SPIRALS, BEVELS

Short or production runs guaranteed workmanship reasonable prices

THE PRECISION GEAR CO.
743 Main Street, Walpole, Massachusetts

Sensitive DRILLING MACHINES Avey

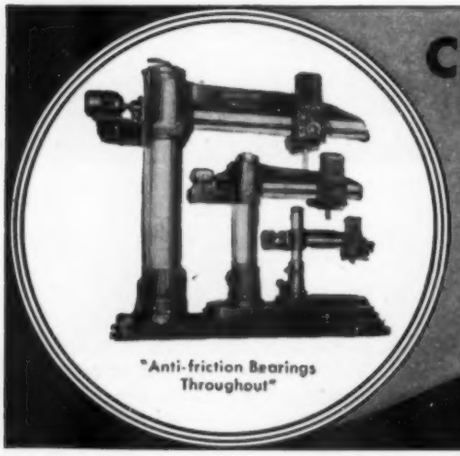
CINCINNATI OHIO

GEAR CUTTING MACHINES

Well Designed
Good Features
Create Production Advantages

43 Years' Experience

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*



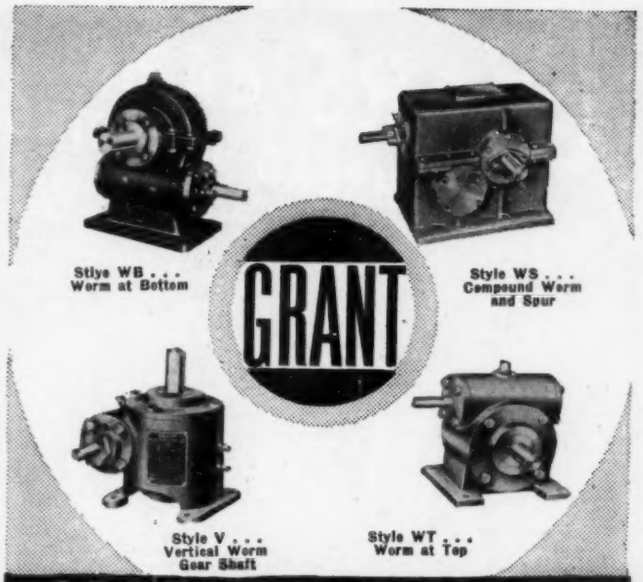
"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.



SPEED REDUCERS

A TYPE FOR EVERY APPLICATION

The completeness of Grand Speed Reducers in sizes, types and ratios makes it a simple matter for designers to incorporate these dependable, long-lived units as integral parts of their equipment. If you are concerned with applying built-in speed reduction to your products, it will be to your advantage to get full details of Grant's contributions in power transmission. Ask for complete specifications.

GRANT GEAR WORKS
SOUTH BOSTON 27, MASS.

CINCINNATI . . .
Spiral Bevel Gears
HAVE MUCH TO OFFER

Maximum performance and dependability are two qualities that are absolutely essential in gears for any industrial purpose.

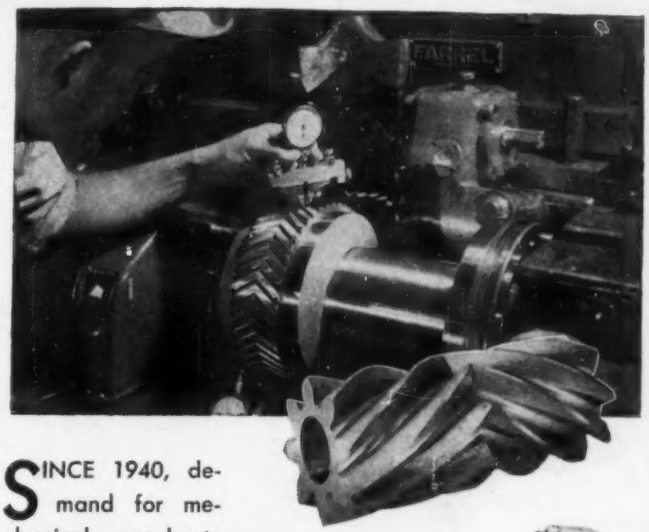
All Cincinnati Spiral Bevel Gears are cut, tested, matched, lapped and marked in individual sets . . . to insure correct bearing location on teeth.

For smooth, efficient operation at high speeds . . . specify Cincinnati Gears, *Good Gears Only!*

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. ▲ Cincinnati 27, Ohio

PRECISION GEARS

for the manufacturer who is thinking of tomorrow



SINCE 1940, demand for mechanical products has far exceeded supply. Buyers, therefore, could not be as "choosey" as before the war. Sensing a change, however, the alert manufacturer is thinking ahead to the competitive markets of tomorrow. He knows there is less competition for a quality product than for a cheap one. Keep your product at the top where competition is not so keen, by sending your gear specs to Sier-Bath.

GEAR RANGES

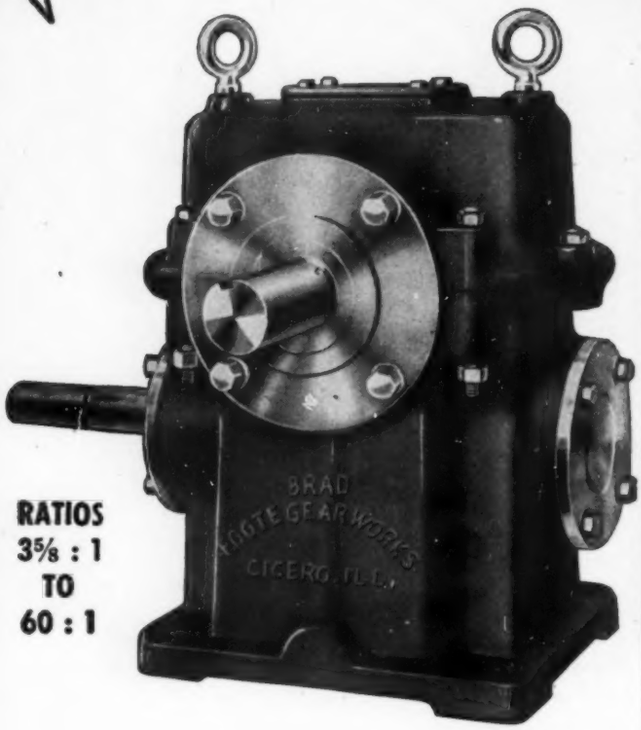
● Spur, helical and worm gears to 48" diameter 3 D.P. and finer; straight tooth bevel gears 32 pitch to 3 pitch, up to 23" P.D. depending on ratio. Gears shaved from 1" to 24". Continuous herringbone gears generated by Sykes method up to 37" O.D. Worms and threads precision ground on J. & L. Thread Grinder to extremely close tolerances. Spur gear grinding up to 16" diameter; helical gear grinding up to 10" diameter. Involute and straight side splines ground up to 42" between centers.

Also Makers of Sier-Bath Screw and Gearex Rotary Pumps

FOUNDED 1905 MEMBER A.G.M.A.

Sier-Bath
GEAR and PUMP CO., Inc.
9246 HUDSON BOULEVARD NORTH BERGEN, NEW JERSEY

WORM GEAR SPEED REDUCERS



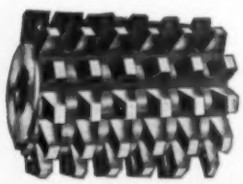
RATIOS
3⅝ : 1
TO
60 : 1

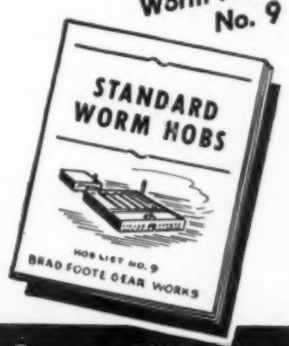
CAPACITY
Production with
Brad Foote Gears

700 STANDARD WORM HOBS!
In Stock Ready for Use

Get our 12 page Bulletin No. 9 showing all dimensions in detail. These hobs are not for sale, being solely for customer use.

Send for Worm Hob List No. 9





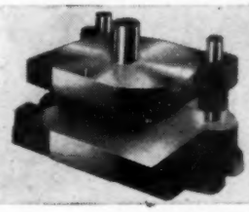
BRAD FOOTE GEAR WORKS
1309 SOUTH CICERO AVENUE
DEPARTMENT P, CICERO 50, ILLINOIS

GEARS CAMS THREAD GRINDING

Any size or shape to utmost accuracy. For quotation on price and delivery Write Dept. G 2

HARTFORD *Special*

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONN.



DANLY
PRECISION DIE SETS
STANDARD OR SPECIAL

Their Precision Means Greater Accuracy in Your Production

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois

Milwaukee . . . . . 111 E. Wisconsin
Detroit . . . . . 1549 Temple Ave.
Cleveland . . . . . 1550 E. 33rd St.
Dayton . . . . . 990 E. Monument
Rochester . . . . . 16 Commercial St.
Philadelphia . . . . . 3858 Pulaski Ave.
Long Island City . . . . 47-28 37th St.
Ducommun Metals & Supply Company
4890 South Alameda, Los Angeles

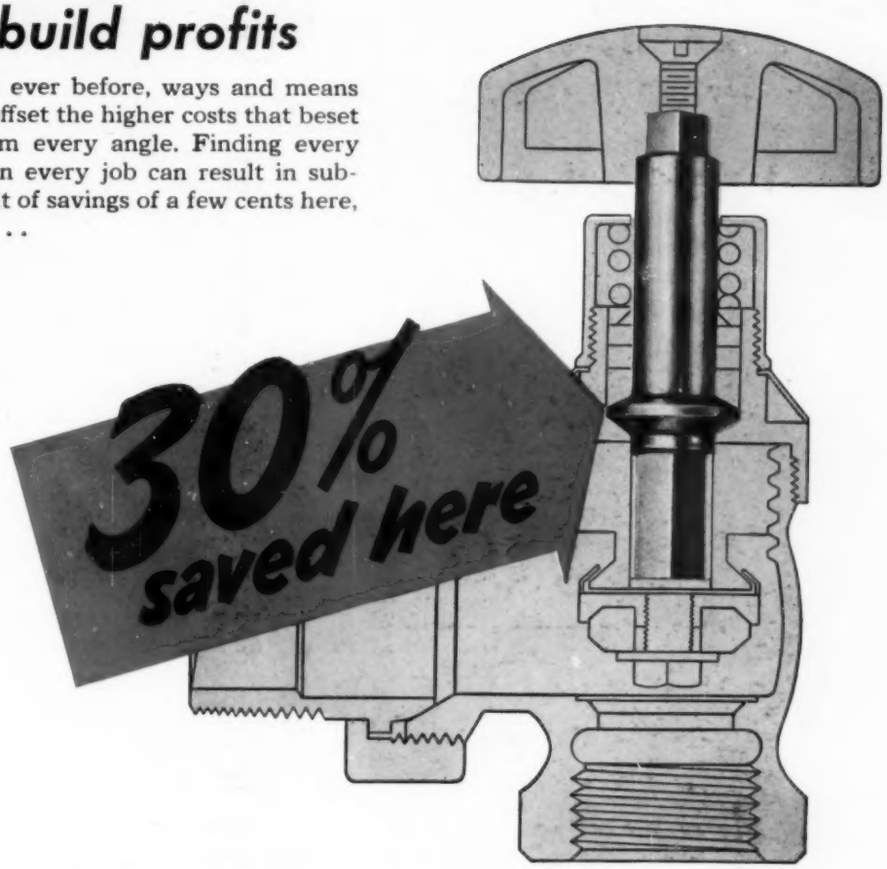
OPEN CAPACITY NOW ON
HERRINGBONE GEARS
CUT ON NEW SYKES GENERATORS
Up to 60" dia.

"The CAPITOL" **AUTO ENGINE WORKS**
349 N. Hamline Ave.
St. Paul 4, Minn.

MEMBER OF AGMA

Pennies build profits

Today, more than ever before, ways and means must be found to offset the higher costs that beset manufacturers from every angle. Finding every possible shortcut in every job can result in substantial profits built of savings of a few cents here, half-a-cent there . . .



by using an ANACONDA DIE PRESSED FORGING

Anaconda Die Pressed Forging and machined counterpart—a valve stem used in radiator valves manufactured by W. D. Cashin Company, South Boston, Mass.

The radiator valve stem illustrated is an example. Formerly, these were turned from rod stock with the squares milled on both ends. Now, an Anaconda Die Pressed Forging eliminates 90% of this machining. The difference is a 30% saving in the cost of producing this one part. In addition, there's the advantage of making several different sizes of valve stems by simply cutting the forging to length.

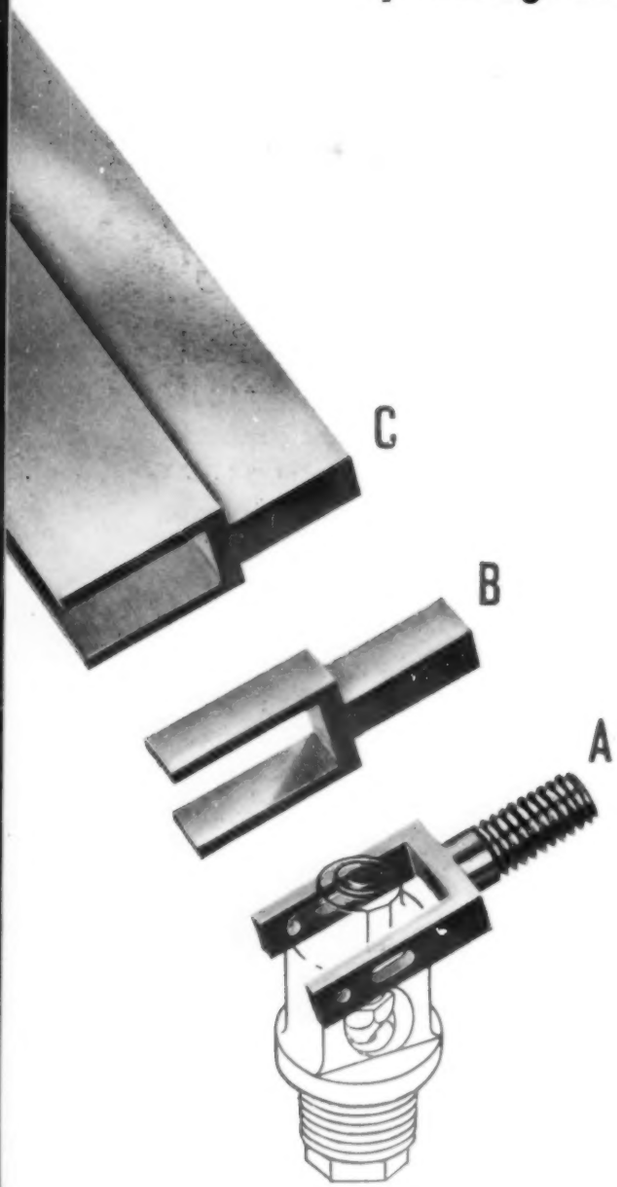
There's a brand new booklet now available on Anaconda Die Pressed Forgings. Its many comparative illustrations may indicate cost-saving methods of producing complicated parts of unusual design. Write for Anaconda Publication B-9.

THE AMERICAN BRASS COMPANY

ANACONDA
from mine to consumer

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada:
ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

by using an ANACONDA EXTRUDED SHAPE



It's really as simple as A-B-C. The brass yoke "A" is part of a ball-float valve in a "Thermoflex" Trap, manufactured by W. D. Cashin Company, South Boston, Mass. It was machined from the blank "B", sawed off the Anaconda Extruded Shape "C". Castings, previously used, proved costly and unsatisfactory. Now, because the extruded brass shape is wrought metal, yet weighs less than half that of solid bar-stock, there's a combined saving of 40% in milling, metal and money.

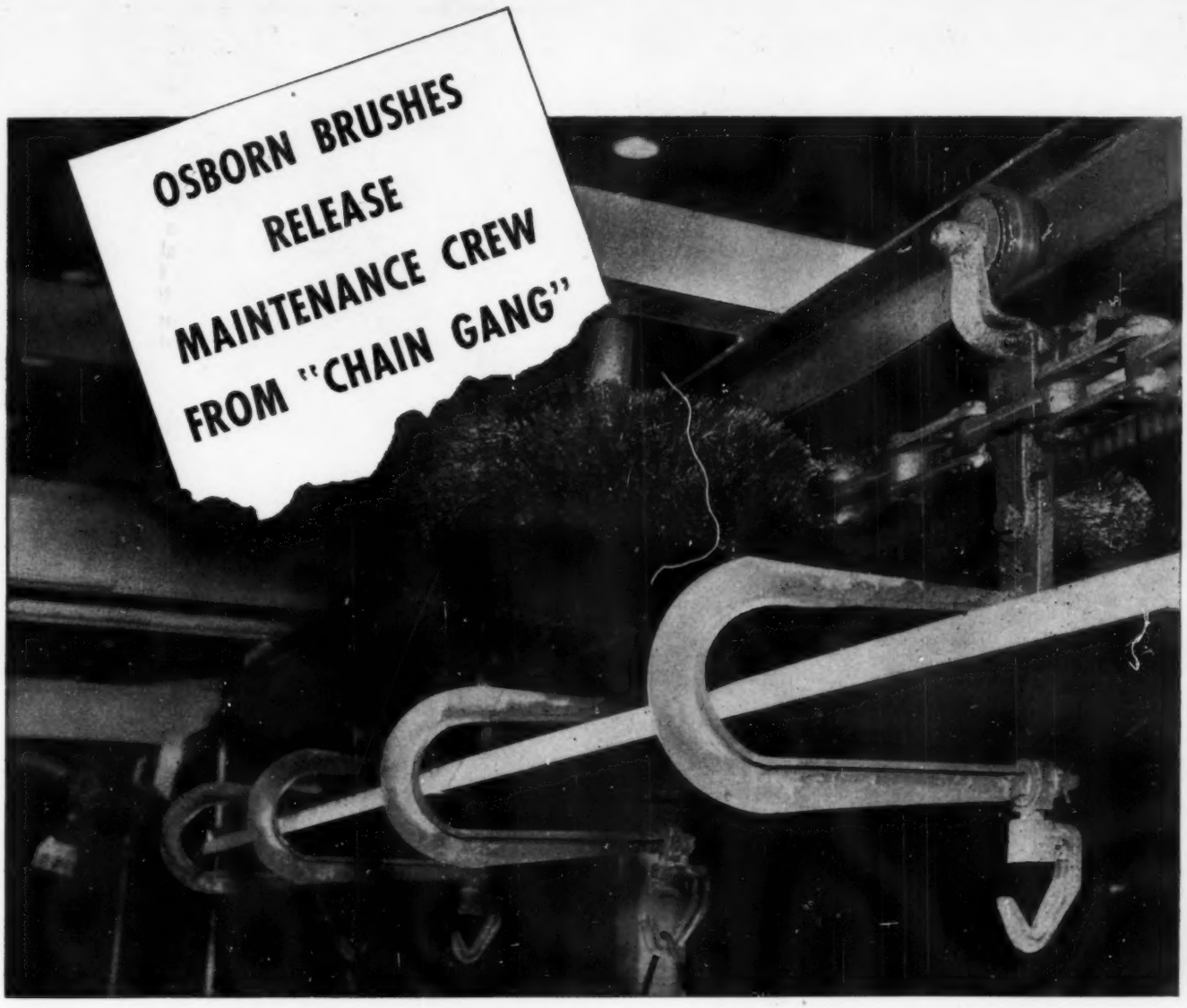
Anaconda Extruded and Drawn Shapes are made as close as possible to the size and shape of the finished product. They machine readily, are consistently accurate in dimensions, and are available in long mill lengths in copper, brass, bronze and a wide range of special copper alloys.

Publication B-28 gives basic information on Anaconda Extruded and Drawn Shapes . . . also on other forms of Anaconda Metals. Write for a copy. 47120

ANACONDA
from mine to consumer

Anaconda
EXTRUDED SHAPES

THE AMERICAN BRASS COMPANY
General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
In Canada: Anaconda American Brass Ltd., New Toronto, Ont.



Continuous cleaning of conveyor chain with brushes simplifies maintenance at General Electric Refrigerator Plant

The new conveyor method of assembly employed at the General Electric Refrigerator Plant, Erie, Pa., is the last word in modern production practices. Here, starting with a compressor unit, a new General Electric Refrigerator literally grows before your eyes as it moves from one operation to another at a speed of 27 feet per minute.

But new ideas create new maintenance problems. At one point in the operation the conveyor chain passes through a rust-proofing solution. This results in a deposit of scale which must be removed from the chain. At first the chain was removed and cleaned in a caustic solution —obviously a costly and time-consuming operation.

Then an Osborn sales engineer was asked for suggestions. The answer and solution is shown above. An Osborn Disc Center Wire Brushing Wheel is mounted on either side of the chain. Revolving with the chain as it emerges from the bath, the brushes remove all dirt and scale. Cleaning is instant and continuous at a mere fraction of former costs.

Time and money-saving ideas such as this are the stock-in-trade of Osborn sales engineers. It's the application that counts and the brushes are only the means to an end. This premium service costs you nothing, may save you much. For complete information write—

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue *Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

How to keep your supply sources right at hand!

With Air Express cutting delivery time from any U. S. point to a matter of hours, it's like lassoing your supply sources and keeping them within quick reach.

You get the fastest possible service with Air Express. Special pick-up and delivery service is included. And since Air Express goes on *every* flight of the Scheduled Airlines, shipments keep moving—*fast*. If you're faced with overseas shipping problems, Air Express can save you *weeks* of delivery time. Use this speedy, inexpensive service regularly.

Specify Air Express - it's Good Business

- Low rates—special pick-up and delivery in principal U.S. towns and cities at no extra cost.
- Moves on all flights of all Scheduled Airlines.
- Air-rail between 22,000 off-airline offices.
- Direct air service to and from scores of foreign countries.

Just phone your local Air Express Division, Railway Express Agency, for fast shipping action . . . Write today for Schedule of Domestic and International Rates. Address Air Express, 230 Park Avenue, New York 17. Or ask for it at any Airline or Railway Express Office.

AIR EXPRESS

AIR EXPRESS GETS THERE FIRST

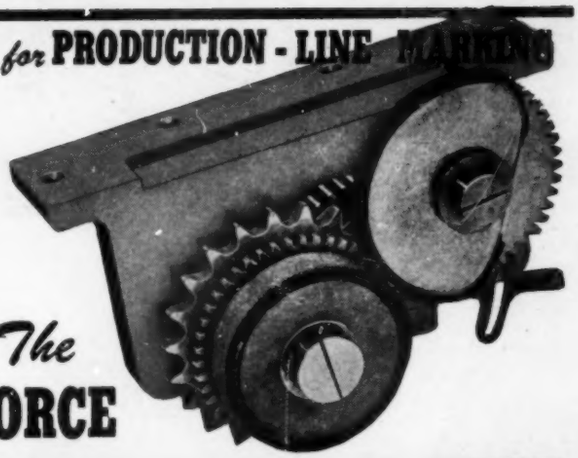
Fastest delivery—at low rates

Memphis, Tenn. manufacturer requested fast delivery of spare parts (34 lbs.) located in San Angelo, Tex. Picked up 11:50 A.M. the 21st, delivered same day at 5:40 P.M. 668 miles, Air Express charge $7.31. Other weights, any distance, similarly inexpensive and *fast*.

AIR EXPRESS DIVISION,
RAILWAY EXPRESS AGENCY
. . . A SERVICE OF

THE SCHEDULED **AIRLINES** OF THE UNITED STATES

for PRODUCTION - LINE MARKING



The **FORCE**

CONVEYOR MARKING ATTACHMENT

Imprint products or containers while they are still on the conveyor without a second's slowing of production. This dependable marking unit attaches to your conveyor, taking its operating power from the chain. It is fully automatic, self-inking, and uses the famous FORCE Base-Lock Rubber Type which permits instant changing of marking code.

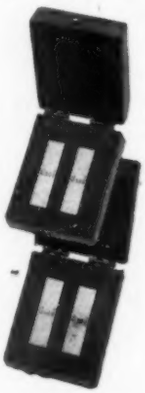
Send for further information today, or mail us your specifications and we will design a special unit for you.

The FORCE Way of Numbers

WM. A. FORCE & COMPANY
INCORPORATED
216 NICHOLS AVENUE, BROOKLYN 8, NEW YORK, U.S.A.

Now! Genuine Ford Johansson
Sintered Tungsten Carbide
GUARD BLOCKS

"A" Standard (±.000004")
"B" Standard (±.000008")



Protect your valuable Jo-Blocks with a pair or two of these new super-hard Johansson Guard Blocks! Simply wring them onto the ends of any Jo-Block combination and they'll fend off virtually all the impact and abrasion of any gaging job.

Practically Wear-Proof!

Made of finest Sintered Tungsten Carbide, finished to Jo-Block brilliance and accuracy. Available in "A" and "B" standards, and in thicknesses of 0.100" and 0.050", cased in pairs or complete sets of four blocks, at very moderate cost.

PATENTED AND WARRANTED BY FORD • TO PROTECT AND ENORMOUSLY LENGTHEN THE SERVICE LIFE OF YOUR

Ford Johansson GAGE BLOCKS

FORD MOTOR COMPANY • JOHANSSON DIVISION
3601 Schaefer Road, Dearborn, Michigan

"We can set 'em up tight without 'skids' ...make a stronger assembly"

say the makers of American KITCHENS STYLED IN STEEL

High-spots from full report of independent investigator of James O. Peck Co., studying assembly savings made in leading plants with Phillips Screws.

★

"HINGES are the weak spots in many kitchen cabinets," explained the purchasing agent for American Central Div.–Avco Mfg. Corp., "But on ours, the hinge is a point of strength, mainly because we use Phillips Screws.

"Tighter Set-up is easy with Phillips Recessed Head Screws. But it's difficult to get the same firm 'bite' in sheet metal with slotted screws because the driver doesn't have the same purchase in the slotted screw as it has in the Phillips Recess. And slotted heads would burr . . . make dangerously sharp edges to cut hands and arms, snag clothing.

"Protects Panels from Driver Gouges. We don't have to worry about driver slippage with Phillips Screws. No patching or repainting to interrupt our assembly.

"Quicker Location of Screw steps up assembly. The instant seating of the driver in the Phillips Recess gets the screw going faster, — and straight, sure driving without worry about slips speeds the whole operation".

Your Assembly Operations Can Benefit by ideas in this report on the American Central Div.–Avco Mfg. Corp. methods, and other reports of assembly studies . . . covering metal, wood, and plastic products. Use coupon.

This is an American Kitchen Cabinet door, getting a hinge that won't loosen in years of opening and closing . . . thanks to the ease with which Phillips Screws can be set up tight without burring, and without driver slips that would gouge the highly finished panel.

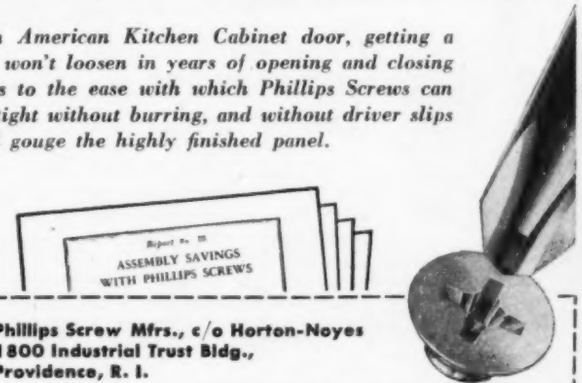
PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

American Screw Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
International Screw Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co
National Lock Co.

24 SOURCES

National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wolverine Bolt Company



Phillips Screw Mfrs., c/o Horton-Noyes
1800 Industrial Trust Bldg.,
Providence, R. I.

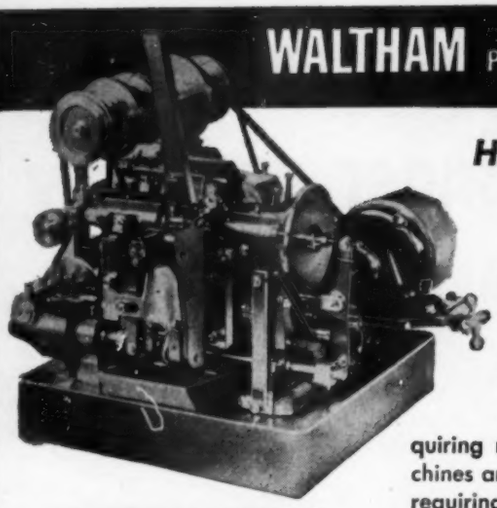
Send me reports on Assembly Savings with Phillips Screws.

Name.....

Company.....

Address..... AM-24

WALTHAM PINION & GEAR CUTTING MACHINES

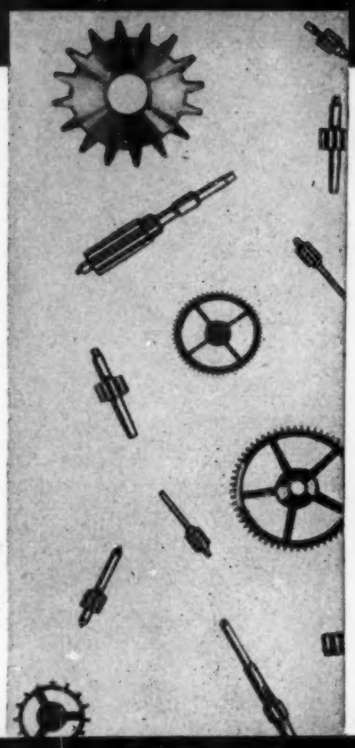


Highly productive—fast and accurate

These machines—made in single-cut, multiple-cut and magazine-feed types—are designed for the fast, precision production of gears and pinions for watches, instruments, fuses, etc. They are simple to operate, requiring no special skill. Magazine-feed machines are fully automatic, the other machines requiring positioning of blank and starting by hand.

Drive for these machines is either from countershaft or by individual motor. On motor driven machines, V-belts drive cutter spindle, worm shaft and pump.

Illustrated literature and detailed specifications are available promptly on request.



SPECIFICATIONS

PINION MACHINES

Diameter capacity, approx. ½"
Coarsest pitch about 32 D.P.
Strokes of Work slide for pinions—.24" to .45"
Strokes of work slide for stacked gears —.85 to 1"

GEAR MACHINES

Pitch diameter, capacity 1½"
Strokes for work slide, .40", .65", 1.00", 1.25"

WALTHAM MACHINE WORKS
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

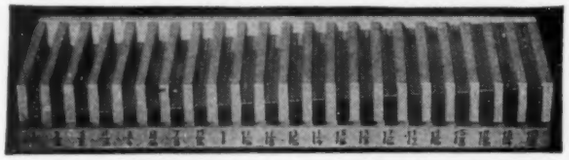
If you want
MORE PARTS *per hour*
LOWER COST *per part*

the BARKER WRENCHLESS CHUCK can do it faster, better and stand up to it longer. Where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine, these Chucks will increase production and pay for themselves in 60 to 90 days while doing it. See how a Barker Wrenchless Two-Jaw or Three-Jaw Chuck can speed up production in YOUR plant.

Chuck Division
THOMAS HOIST CO.
22 S. HOYNE CHICAGO 12

ANTON PARALLELS

INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS
ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.



Price per set includes a handy Wooden Container. Large Stock of Single Pairs also Available. All Prices are F.O.B. New York

ANTON MACHINE WORKS
52 Sands St. Tel. TR. 5-8092 Brooklyn 1, N. Y.

Only Reliable Products Can Be Continuously Advertised

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St, — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

Available for immediate delivery!

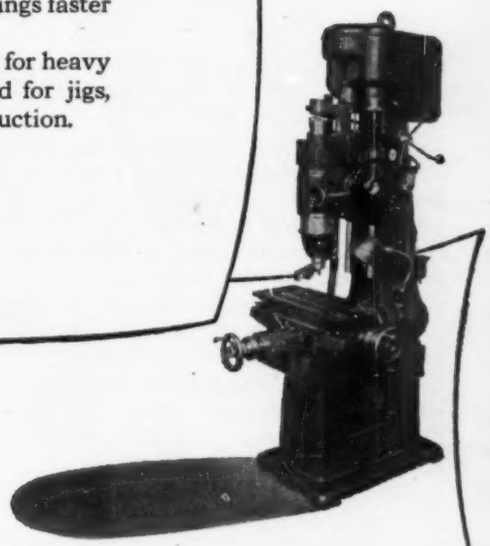
TWO TOOLROOM MUSTS

Spots...Drills...Bores or Reams
All Holes In a Workpiece
With Minimum Tool Changes

With the Moore Jig Borer, there's less stop-and-start to change tools at individual holes for each operation, because no size blocks or end measures are necessary. *Built-in* lead screws, accurate to .0002" over 14" of travel, enable you to make table settings faster than you can change tools.*

Highly sensitive for holes 1/32" diameter, yet rugged for heavy cuts up to 4½", the Moore Jig Borer is ideally suited for jigs, fixtures, dies, machine parts and jig-less, small lot production.

MOORE JIG BORER



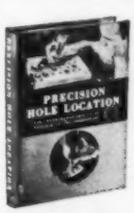
Mechanically Relocates and Finish-Grinds
Holes in Hardened Parts to .0001"
in ⅓ The Time of Other Methods

The Moore Jig Grinder eliminates hours of checking on the bench and surface plate to correct holes in hardened parts. No toolmaker's buttons or locating plugs are necessary, for this unique machine through the use of *built-in* lead screws *mechanically* relocates and finish-grinds straight or tapered holes in ⅓ to ¼ the time required by conventional methods.*

Working to figures instead of to "fit," the Moore Jig Grinder puts die making on an interchangeable parts and assembly basis for the first time. Die, stripper and punch plates can now be produced concurrently with better alignment of mating parts and more uniform clearance between punch and die.

MOORE JIG GRINDER

*Write today for descriptive literature



HAVE YOU BOUGHT YOUR COPY OF "PRECISION HOLE LOCATION"?

Over 5,000 copies of this valuable book on toolmaking practices have been sold to date. Available at special price of $3 in U.S.A.; $3.50 outside U.S.A.—448 pages, over 400 illustrations, 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Send check or money order to Moore Special Tool Co., Inc., Bridgeport 7, Conn.

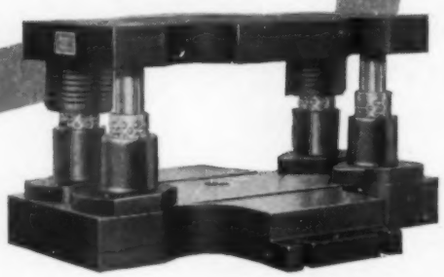
MOORE TOOLS

MOORE SPECIAL TOOL COMPANY, INC.

738 UNION AVENUE • BRIDGEPORT 7, CONNECTICUT

STRETCH DIE LIFE

WITH LEMPCO PRECISION ANTI-FRICTION DIE SETS



Licensed under inventions of Guy Connor

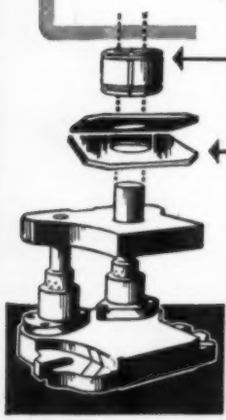
Cash in on all the production built into your dies; stretch die life by mounting them in Lempco Anti-Friction Die Sets.

These precision sets guarantee perfect alignment of punches and dies. Pre-loaded anti-friction bearings between leader pins and bushings never allow the slightest play; they prevent any lateral motion or tilting of the punch holder, so that punch and die engage squarely every time. Clearance between cut edges is maintained. Chipping of edges is eliminated. You obtain more production per grind and longer die life.

They open and close easily, too—end the danger of accidental damage caused by pry bars, jacks and hammers. And, they offer positive, simplified lubrication.

Lempco Anti-Friction Die Sets can be made in any shape or style. Take a minute NOW to learn more about them. Just drop us a card. You'll have your fully-illustrated catalog by return mail.

EXTRA PROTECTION FOR DIES



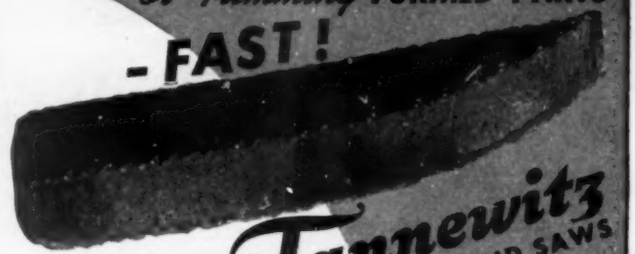
BALL JOINT SHANKS
eliminate perpendicular misalignment between shank clamp bushing and die set.

BALL ACTION DI-ALI-NERS
automatically correct punch press misalignment, front to back, left to right, or diagonal. Matched spherical plates, machined and cadmium plated for long life.

LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO

for Sawing METAL *as* HARD *as a* FILE
or Trimming FORMED PARTS
- FAST!



Actual photo of file friction sawn on Tannewitz High Speed Band Saw

Tannewitz
HIGH SPEED BAND SAWS

Cost reductions that are downright amazing are effected in the cutting of an extremely wide variety of materials by friction sawing with TANNEWITZ HIGH SPEED BAND SAWS: flat sheets, hardened or soft steels, armor plate plastics, and many others. Formed aluminum parts can be trimmed without using a rest of any kind. Whatever your cutting problem, chances are it can be done faster and better with TANNEWITZ HIGH SPEED BAND SAWS. Write for booklet: "FRICTION SAWING."

THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

RUTHMAN PUMPS

help you get GREATER EFFICIENCY on your machines

To the right is a 16" Lodge & Shipley Selective Head Engine Lathe equipped with a Model 2-P3 Long, 1/10 HP Gusher Coolant Pump.

To the left is a Baush Three-Spindle Vertical Boring Machine equipped with a Model 11025 Ruthman Gusher Coolant Pump.

Oversized prelubricated bearings requiring no further lubrication, electronically balanced, one-piece rigid shaft, no metal-to-metal contact gives greater efficiency in Ruthman Gusher Coolant Pumps. You are sure of years of trouble-free service at low maintenance cost when you specify Ruthman Gusher Coolant Pumps on your metal-cutting machinery

Write for Catalog 10-A

THE RUTHMAN MACHINERY CO.
1818 READING ROAD CINCINNATI 2, OHIO

Phillips, Frearson, Clutch Head, Slotted, Socket or Hex Head Screws

—it's all the same to Apex

No matter what make of electric, air or spiral driver you use Apex has the *right* bit for driving the screws named above.

Apex bit holders do a big job and keep tool inventories to a minimum. You get the bit holders you need for *your* drivers—then simply order new tips as needed and discard the old ones.

For hex head screws from 7/32" through 9/16" hex, use Apex double-life sockets. When one end of the socket becomes worn, turn it end for end on the shank and get an *extra* service life.

Write for Catalog 20, which gives all the details.

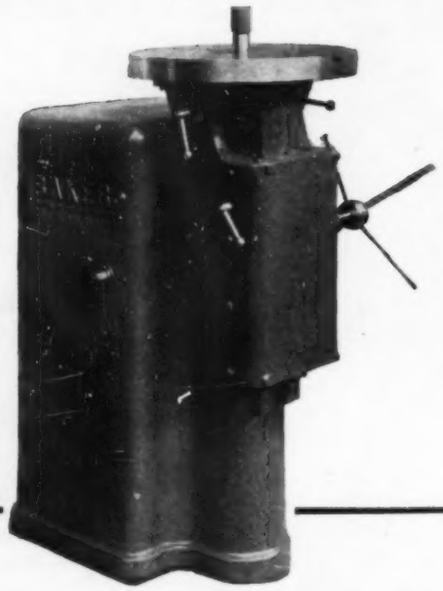
APEX Screwdriver Bits

THE APEX MACHINE & TOOL COMPANY, 1030 South Patterson Blvd., Dayton 2, Ohio

Safety Friction Tapping Chucks • Quick Change and Positive Drive Drill Chucks • Vertical Float Tapping Chucks • Parallel Floating Tool Holders • Power Bits for Phillips, Slotted Head, Frearson and Clutch Head Screws • Hand Drivers for Phillips and Clutch Head Screws • Aircraft and Industrial Universal Joints • Sockets and Universal Joint Socket Wrenches

BAKER

CONTOUR GRINDER



ACCURATE, COST-SAVING PERFORMANCE

On Work like this . . .

Flat Cam

Die

Lever

Contour Grinding is *rapid, economical* and *accurate*... with this Baker Model No. 3 Grinder for grinding inside or outside irregular contours... and reforming dies when worn from use.

Performs hand grinding which other types of grinders won't readily handle. Has vertical reciprocating movement of spindle—3/16". Diamond dresser is standard equipment and is quickly mounted. Table is counter-weighted for easy positioning and may be tilted for angular work. Capacity, diameter of wheels—1/2" to 4". Capacity, face of wheels—2", 2 1/2", 3". Diameter of table 18". Write for illustrated circular.

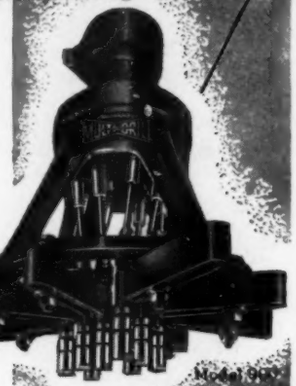
BAKER BROTHERS, Inc.
TOLEDO, OHIO
DRILLING—TAPPING—KEYSEATING—CONTOUR GRINDING MACHINES

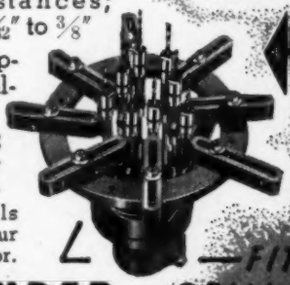
Adjustable
MULTI-DRILL
for Production Drilling

9" DRILLING AREA
—AVAILABLE WITH 2 TO 8 SPINDLES

- Designed for accurate, high speed production drilling
- RUGGED CONSTRUCTION
- Quick, easy adjustments to **any** hole pattern on or within a 9" circle; 1/2" minimum center distances; Drill sizes 1/32" to 3/8"
- Special adaptations available.

MULTI-DRILLS are made in other sizes and models.
Write for details and name of your nearest Distributor.





Locater arms are designed for fast, easy adjustment

—FITS ANY DRILL PRESS

Dependable Performance . . proven by industry

COMMANDER MFG. CO.
4229 W. KINZIE STREET
CHICAGO 24, ILLINOIS

Save Hands Speed Production with—

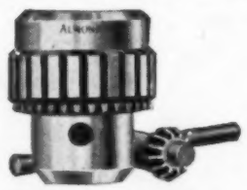
LITTELL
Pres-Vac Safety Feeder

KEEP workmen's hands out of Danger Zone. Use PRES-VAC Safety Feeders to keep hands safe, improve quality and speed production. Pres-Vac acts on trigger-vacuum principle. Picks up—drops—material instantly. Uses compressed air, 10 to 45 lbs. pressure.

Littell makes a complete line of pressroom equipment, including: Reels, Roll, Dial and Magazine Feeds; Straighteners; Air-Blast Valves; Scrap Winders, etc. *Request Bulletins.*

F. J. LITTELL MACHINE CO.
4169 Ravenswood Ave. CHICAGO 13, ILL.

ALMOND DRILL CHUCKS



Maximum Gripping Power with Extreme Accuracy and Long Life

Write for Catalog

T. R. ALMOND MFG. CO.
Ashburnham, Mass., U. S. A.

Sail the Seven "C's" of Production...

COST
CLASS
CONTROL
CONFIDENCE
CONSTRUCTION
CRAFTSMANSHIP
COMPLETENESS

with Axelson Lathes

Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes. Also 20 and 25-inch hollow spindle "Oil Country" Lathes.

The investment you make when you buy a heavy duty engine lathe justifies a most careful selection... If you *thoroughly* canvass the market you will find that the *Axelson* heavy duty lathe really does *have everything*... With your voyage of lathe discovery behind you the name of Axelson will loom up boldly ahead... A name which stands against a background of quality, metallurgy, accuracy and low per-piece cost of production... More than thirty years of "quality first" manufacturing principles, with complete construction at the home plant, combine to give you supreme *Axelson Lathe satisfaction.*

AXELSON MANUFACTURING COMPANY

6160 So. Boyle Ave., (Box 98, Vernon Station), Los Angeles 11, California

AXELSON Lathes

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

DEPENDABLE FOR OVER A QUARTER CENTURY

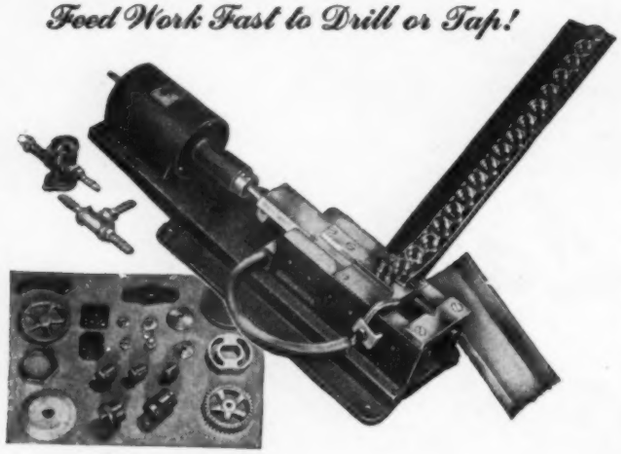
Boost Output

with

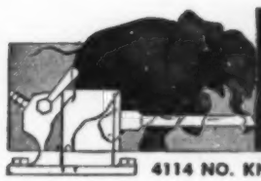
MEAD

WORK FEEDERS

Feed Work Fast to Drill or Tap!



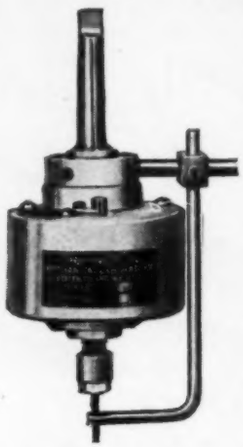
As-fast-as-you-can-step-on-a-button the sensational new Mead pneumatic WORKFEEDER delivers, holds, ejects small parts to be drilled, reamed or tapped. Accommodates stampings, castings, screw machine parts, etc. Adjustable to sizes up to 3". Foot automatic control; operator's left hand is free to keep hopper loaded. Write for new Mead AIR POWER Catalog describing "Mead Family" of air operated fixtures and devices.



MEAD
SPECIALTIES COMPANY

4114 NO. KNOX AVE., Dept.MA-127, CHICAGO 41, ILL.

CUT SMALL HOLE TAPPING COST



Send for CATALOG

With the *new* and *improved* ERRINGTON "Cushion" Cone High Speed Tapper with the 2:1 reverse.

Ball & Bronze bearing throughout.

Taps to 3/16 in steel, 1/4 in cast iron.

Also: Multiple drilling & tapping attachments, auto opening dieheads, clutch tappers to 2" taps.

ERRINGTON MECHANICAL LAB.
Main Office & Wks.: STAPLETON, S. I. 4, N. Y.
Established 1891

12 FARNHAM SPECIAL MACHINES

REPLACE
1600
STANDARD UNITS!

Sounds unbelievable doesn't it? But it is true. On of our country's great manufacturers had a production problem. Farnham engineers were called in to make recommendations.* Special machinery was planned, designed and built by Farnham. But . . . get the whole story of savings in money, savings in labor and savings in materials from the Farnham representative.

** No charge for consultation or surveying your requirements.*

FARNHAM

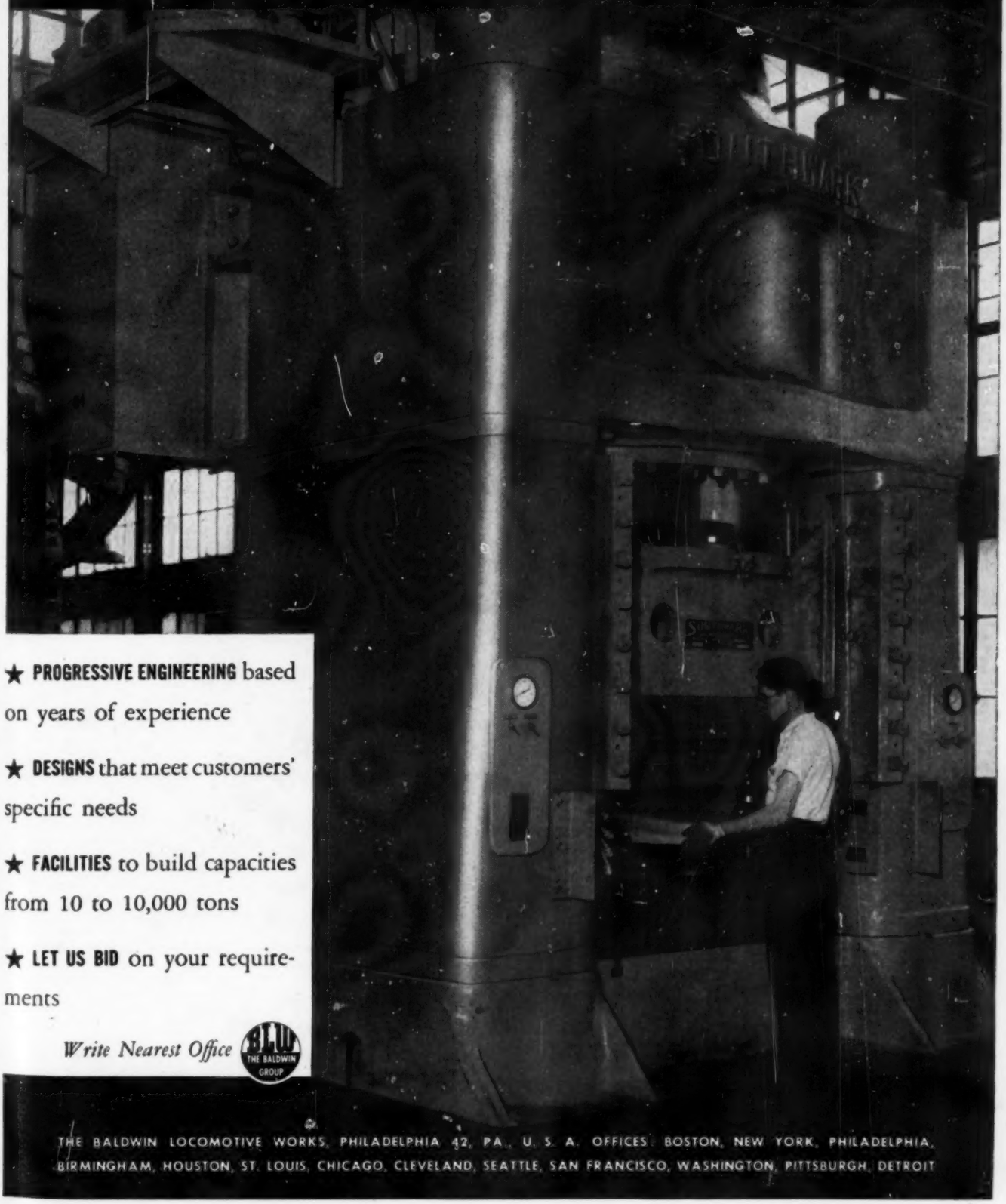
MANUFACTURING COMPANY
1646 SENECA ST. BUFFALO 10, N. Y.

Representatives

MR. HENRY A. POWIS
1233 Lincoln Boulevard
Santa Monica, California
Phone: Santa Monica, 5-4004

MR. CHARLES L. WACHTER
55 W. 42nd Street
New York 18, New York
Phone: Chickering 4-2564

BALDWIN
SOUTHWARK
HYDRAULIC PRESSES



★ **PROGRESSIVE ENGINEERING** based on years of experience

★ **DESIGNS** that meet customers' specific needs

★ **FACILITIES** to build capacities from 10 to 10,000 tons

★ **LET US BID** on your requirements

Write Nearest Office

BLW THE BALDWIN GROUP

THE BALDWIN LOCOMOTIVE WORKS, PHILADELPHIA 42, PA., U. S. A. OFFICES: BOSTON, NEW YORK, PHILADELPHIA, BIRMINGHAM, HOUSTON, ST. LOUIS, CHICAGO, CLEVELAND, SEATTLE, SAN FRANCISCO, WASHINGTON, PITTSBURGH, DETROIT

That Unseen Extra Quality

MEN WHO KNOW

Specify "Republic"

Inspectors and Production men whose first consideration is value, invariably pick REPUBLIC GAGE as their source for gages.

For years REPUBLIC has enjoyed top rating as manufacturers of thread gages with "THAT UNSEEN EXTRA QUALITY." May we serve you?

RELY ON REPUBLIC

REPUBLIC GAGE

DETROIT 21, MICHIGAN

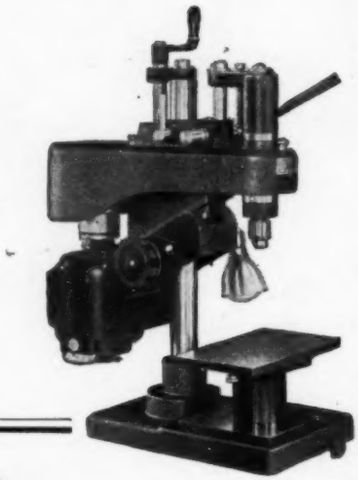
"COLUMBUS DIE-TOOL"

specialists in special tools and machinery!

Since 1906 Columbus Die Tool have specialized in designing and manufacturing accurate, top grade special-purpose machinery and tools. Whenever you have a particular job or problem, please permit us to design and manufacture same for you, efficiently, quickly, and economically.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUNCHES AND DIES

COLUMBUS DIE-TOOL and Machine Co.
955 CLEVELAND AVE.
COLUMBUS 16, OHIO
ESTABLISHED 1906



Spare a moment?

Your job requires production of small, precision holes! .004" to 5/16" in any drillable material? Take a tip from other precision manufacturers. From watch, clock and instrument makers. Investigate the Hamilton Varimatic, Super Sensitive, Variable Speed Drilling Machine. 80% of present Hamilton installations are repeat orders. That's proof of its usefulness! Spare a moment now to investigate. It may well mean dollars-in-your-pocket. Clip this ad, attach to your letterhead and mail. We will send our Bulletin V-47. And V-47 will give you the whole story. Do it now!

THE *Hamilton* TOOL COMPANY
830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

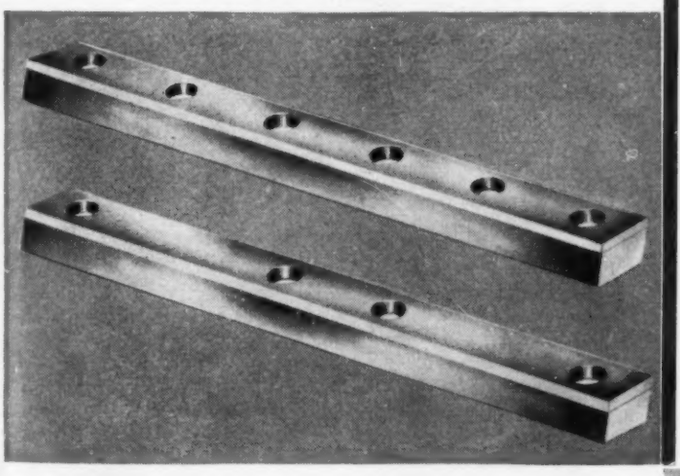
Keep Your Machines Running!

Have your wearing parts made of HAYNES STELLITE Alloy

Machinery parts made of HAYNES STELLITE alloy help to keep your equipment operating at full capacity longer . . . and at lower cost. Because of its unique combination of properties, HAYNES STELLITE alloy resists severe abrasion, corrosion, erosion, and heat. This means long, trouble-free life for your machines and equipment . . . reduced maintenance cost . . . full production schedules with a minimum of shutdowns for repairs and replacements.

You can obtain HAYNES STELLITE machinery parts made to your specifications. They can be ground to required tolerances and polished, where needed, to perfect surfaces. Send us your blueprints and we will produce the parts completely finished—ready for use.

For more detailed information write or telephone to our nearest district office.



Wear Strips—assure accuracy of alignment for boring, driving, and pilot bars. Used on wearing plates for jigs and fixtures, and other metal surfaces requiring high abrasive resistance.

Cylinder and Piston—used in babbitting machine—withstand corrosive action of molten metal.

Plunger Lever Pins—accurately finished for use in Diesel engine fuel pump.

The registered trade-marks "Haynes", and "Haynes Stellite" distinguish products of Haynes Stellite Company.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company

Unit of Union Carbide and Carbon Corporation

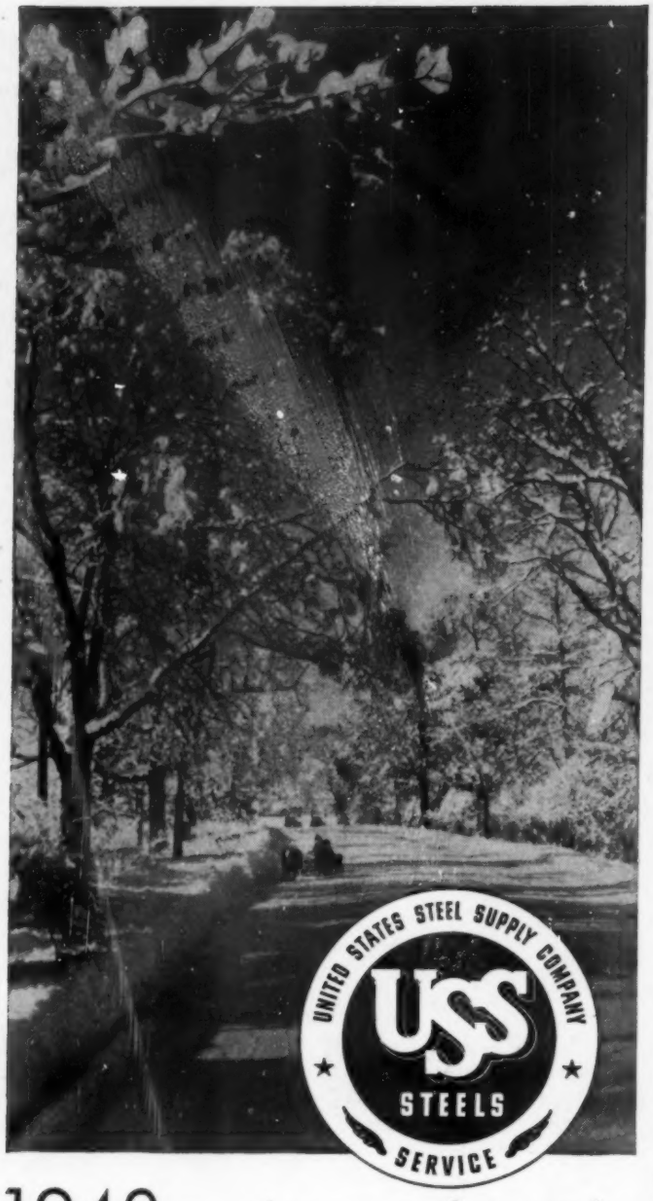
UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago—Cleveland—Detroit—Houston

Los Angeles—New York—San Francisco—Tulsa



1948 — *A year of promise*

WITH the arrival of another Holiday Season, we find ourselves looking forward to 1948 as—A Year of Promise. This good feeling comes from the knowledge that the steel industry is already engaged in the greatest expansion program in its history.

The benefits of increased supply from added producing facilities will naturally be gradual, but we go into 1948 fully expecting to do a better job of taking care of your steel requirements.

We have already improved our facilities for service by erecting new modern warehouses in Cleveland and St. Louis. We have also opened a new warehouse in Los Angeles which will go a long way toward supplying the needs of steel users on the West Coast. And we expect to make other improvements and additions to our service facilities during 1948 so that our name will continue to be a "Symbol of Service" to steel users.

Meanwhile, we extend to you our cordial best wishes for a happy Holiday Season and a successful, prosperous New Year.

UNITED STATES STEEL SUPPLY COMPANY

Baltimore · Boston · Chicago · Cleveland · Los Angeles
Milwaukee · Newark · Pittsburgh · St. Louis · Twin City (St. Paul)

UNITED STATES STEEL

If you have a SPECIAL PROBLEM

in any of these operations, where precision work is demanded and where greater production at man-hour savings is paramount—

• BORING—rough, semi-finish and finish • MILLING (special types) • STRAIGHT LINE DRILLING • UNIVERSAL ADJUSTABLE SPINDLE DRILLING • HONING • TAPPING • REAMING • COUNTERBORING • VERTICAL AND WAY-TYPE EQUIPMENT

then a Moline Multiple Spindle Specially Designed machine tool is your answer. Moline tools are ruggedly built and engineered to fit your PARTICULAR requirements, they're made to last for years, they're easy to change over to other jobs, they do better work at less cost and stand up to it longer.

For YOUR special problem, go "HOLE-HOG," write us for any information you may need.

MOLINE TOOL CO.
100 20th Street Moline, Illinois

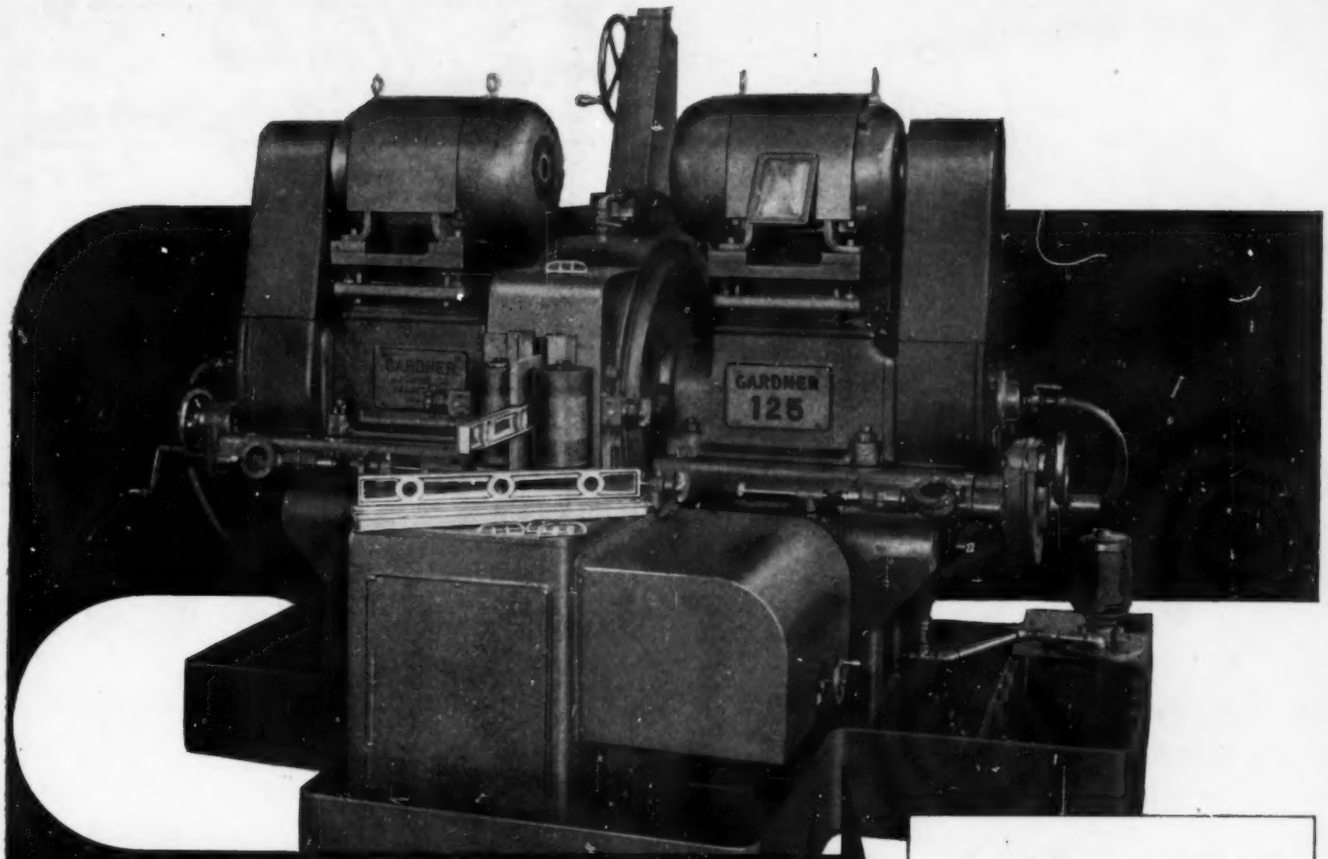
LINLEY

MILLER AND JIG BORER

Handles a wide variety of toolroom jobs with speed, accuracy, efficiency . . . die work, jig and model making, drilling, reaming, milling. Releases larger machines for work better suited to their capacities. Easy set-up, quick changeover . . . velvet-smooth feed, eight spindle speeds from 275 to 4250 rpm. . . simple, direct micrometer setting.

FOR COMPLETE INFORMATION, WRITE FOR BULLETIN.

LINLEY BROTHERS CO., 664 STATE ST. EXTENSION BRIDGEPORT 1, CONNECTICUT



Gardner DOUBLE Grinders DOUBLE Production on dozens of parallel-surface parts

● The practical way to lower high labor costs, is to increase production. Gardner DOUBLE Grinding does just that, on dozens of parallel-surface parts — such as the aluminum and cast iron levels being ground on the Gardner No. 125-26" DOUBLE Grinder shown above.

You can hold down *your* grinding costs, while keeping within closest tolerances, on many similar jobs.

Send for Latest Bulletin on Gardner DOUBLE Grinding!

WORK DATA

Part Levels

Material Aluminum and cast iron

Operation Grind sides, top and bottom

Tolerances .001" to .002" for parallelism; .004" for uniformity

Stock Removal Top and bottom = .030" overall, sides = .030" first cut; .005" second cut.

Production 10' to 30' per min. per cut.

Machine #125-26" Gardner Grinder

Fixture "Feed through" fixture with rubber rolls.

GARDNER - GRIND YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

410 East Gardner Street · · · · Beloit, Wisconsin, U.S.A.

A revolutionary development in MACHINISTS' HAMMERS

Designed by a shop man for Shop Men

This NEW development in machinists' hammers provides economy, ease of handling and simple replacement of heads. These tools are available with any or all six easily interchangeable heads of different materials to meet specific needs. Heads are locked on in use and cannot work loose. The use of malleable heads assures protection from chipping or marring tools, dies, molds or parts.

Exclusive Features

- Steel "No Spread" ring on head prevents spreading of head.
- "Safety Pin" in head keeps head on bushing . . . prevents separation.
- Lock Washer keeps head tight on handle.
- Shank . . . pinned to handle.
- Shank . . . all one piece.

Spark Proof Mallets are available for use under hazardous conditions in chemical and munition industries.

Don't Throw Away a Hills Mallet . . . Just Replace the Head.

HILLS MANUFACTURING CO.
Springfield Avenue, New Providence, N. J.

HILLS MANUFACTURING CO., New Providence, N. J.
Gentlemen: Kindly send complete, illustrated literature on Hills Shop Mallets.

Name .....

Position .....

Company .....

Address .....

Memo

PURCHASING DEPT.

More economical to have Curtis machine special universal joints before assembly. Send them our blueprints

It saves man-hours and machine time to have joints shipped ready to install. Possible error or spoilage of joints in machining is eliminated.

Curtis can furnish forks to exact length required with hubs accurately turned, broached or bored for square, round, keyed or splined shafts. They have special jigs, equipment, and experienced craftsmen to do this work with the same precision and accuracy used in making standard Curtis Universal Joints.

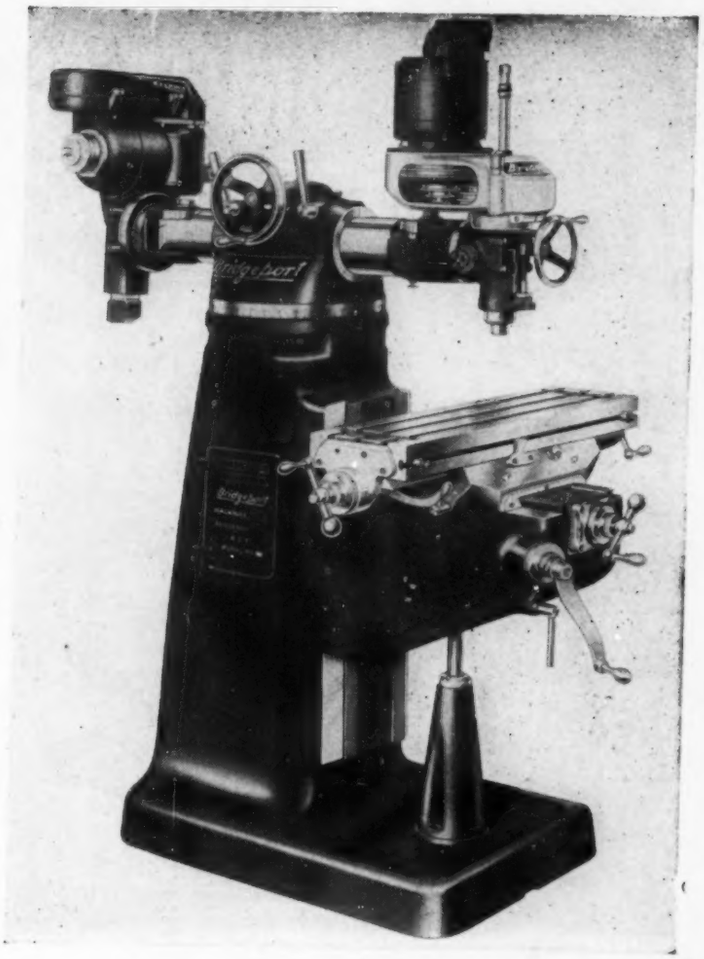
Be sure to send Curtis blueprints and specifications with inquiry or order.

WRITE DEPT. B-3.

CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

Bridgeport TURRET MILLING MACHINE

Adaptable to milling drilling, boring and shaping at all angles AT ONE SET-UP



Outstanding in versatility and utility, the BRIDGEPORT TURRET MILLING MACHINE can be kept busy on a wide variety of work with a minimum of floor-to-floor time. Change in job or operation can be handled with utmost speed and convenience. High precision is assured regardless of the operation being performed.

The "BRIDGEPORT" is the machine of tomorrow, available today. Its streamlined design gives it a modern appearance; its highly productive performance gives it a rightful place in the modern shop.

Full details are available on request.

Specifications

Longitudinal Feed—20" with standard table
Cross Feed—9"
Vertical Feed of Knee—16"
Standard Table—9" x 32"
Special Tables 36", 42" and 48" available; also longitudinal power feed.
Weight with shaping Unit—2000 lbs.

Bridgeport MACHINES, INC.
Bridgeport, Connecticut

Step up multi-spindle Operations with **OLIVER GROUND DRILLS**

- Better Performance
- More Production
- Longer Tool Life
- Less Scrap

Methods studies, taken on drilling operations, have proven that drills sharpened by machine will outlast and outperform drills sharpened by hand.

The OLIVER DRILL POINTER produces the only theoretically correct point for mass production drilling—All points are the same on all drills. Correct clearance and hollow ground centers assure that all drills are drilling equally at the same time.

Without cost to you—send us a few drills to sharpen—Test them on your jobs—you'll see a marked improvement in your equipment and tools.

OLIVER INSTRUMENT CO.

1414 E. Maumee St. Adrian, Mich.

WRITE FOR 510 CATALOG

IMPROVE YOUR TOOLROOM IT'S THE BACKBONE OF PRODUCTION

OLIVER OF ADRIAN

Die Cushions for every punch press application.

Write for catalog #100-1.

DAYTON ROGERS MANUFACTURING CO.
MINNEAPOLIS 7, MINNESOTA

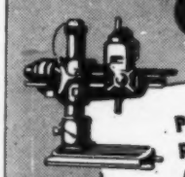
GROBET
Precision
Swiss Files
Chrome Steel

Over 5,000 Shapes and Sizes

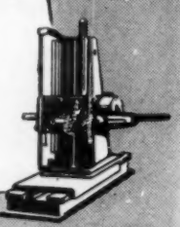
Send for Catalog SF

GROBET FILE CO. of AMERICA, Inc.
421 Canal Street New York 13, N. Y.

GILBERT

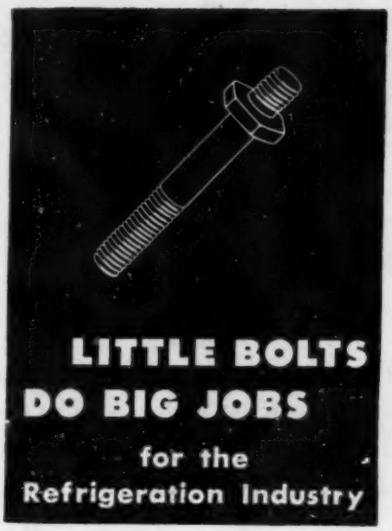


PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



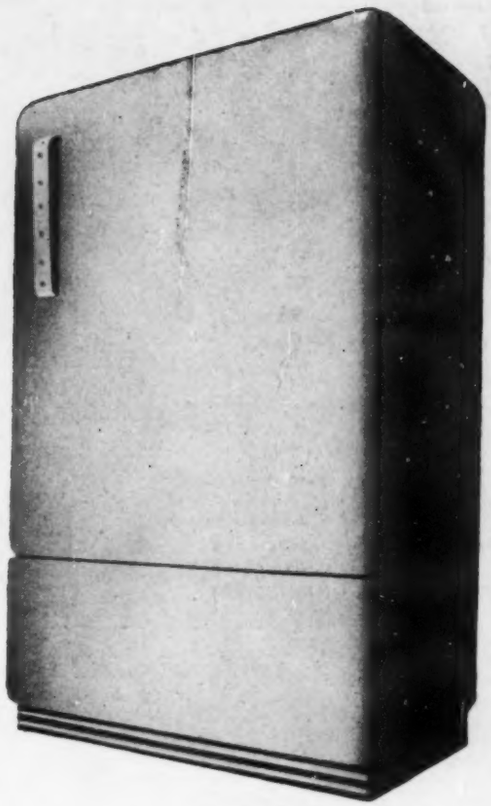
DETAILS ON REQUEST

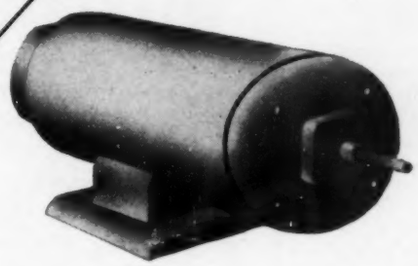
THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO



LITTLE BOLTS DO BIG JOBS

for the Refrigeration Industry





THE complexity of modern, manufactured items reflects itself in the increasing demands for special type nuts and bolts. The unusual bolt illustrated, for example, is a *vital* part of the compressor unit of a well-known national brand refrigerator . . . *convincing evidence that little bolts do big jobs for big industry.*

Whether they are standard or special, all circle Ⓑ products have the same uniform, controlled quality that serves to make your production more efficient . . . your products more salable.

DID YOU KNOW *that we have our own large machine shop where dies are carefully made by our own skilled toolmakers?*

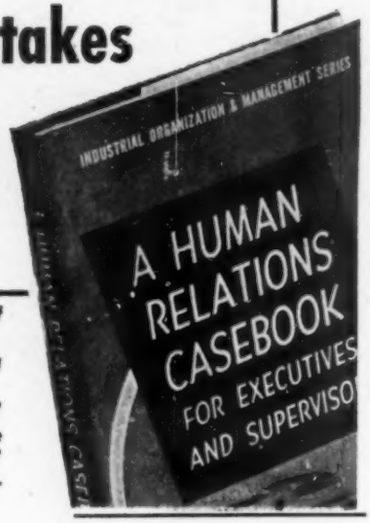
Ⓑ BUFFALO BOLT COMPANY

NORTH TONAWANDA, N. Y. · SALES OFFICES IN PRINCIPAL CITIES

Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

Do YOU make these mistakes

—in dealing with your workers?



- *Fail to make the most of the "personal touch"?*
- *Go overboard in making promises?*
- *Drive too hard a bargain?*
- *Pass up the benefits of the other fellow's viewpoint?*
- *Discourage initiative without realizing it?*

You'll find this practical case-study approach to personnel relations an invaluable aid in solving nearly every type of employee problem in your plant. This new book is built around actual case histories—it shows *real* people confronted with *real* situations. It describes the management practices, *both good and bad,* that executives and supervisors have used to handle such situations . . . directs your efforts along lines that insure a smooth-running, efficient organization.

Just Published!

A HUMAN RELATIONS CASEBOOK

for Executives and Supervisors

By FRANCIS S. DRAKE and CHARLES A. DRAKE

187 pages, $2.50

McGraw-Hill Industrial Organization and Management Series

Every case in this book illustrates the focal point of some situation dealing with the selection, induction, training, promotion, transfer, or dismissal of workers. Covering the broad range of personnel activities, it gives you command of numerous supervisory techniques that have been proved successful by others—it shows you how to make profitable use of the "human touch" in solving successfully your own personnel problems.

Helps end personnel problems

Basically, this book helps you keep personnel situations from becoming *personnel problems.* It shows you how to anticipate trouble, and how to prevent serious difficulties by more intelligent handling. The principles outlined in this book can save you hundreds of dollars in lost production from slowdowns, walkouts, and costly strikes. *Send for it today on the 10-day free-trial plan described below.*

75 typical cases illustrate effective personnel techniques

- *17 cases show you how to place your personnel in jobs where they will help you the most*
- *11 actual situations outline methods for promoting the proper attitude among workers*
- *11 cases illustrate the proper methods for handling incentive systems*
- *8 cases show the value of fair bargaining with individuals and groups*
- *6 methods are analyzed to help you extract valuable suggestions from your employees*
- *22 examples illustrate good and bad habits of supervisors and executives in employee relations*

10-DAY FREE EXAMINATION!

McGRAW-HILL BOOK CO., Inc., 330 W. 42nd St., NYC 18

Send me Drake and Drake's **A HUMAN RELATIONS CASEBOOK** for 10 days' examination on approval. In 10 days I will remit $2.50 plus a few cents postage, or return the book postpaid. (Postage paid on cash orders.)

Name .....

Address .....

City and State .....

Company .....

Position A-12-18-47

(For Canadian price, write McGraw-Hill Co. of Canada Ltd., 12 Richmond Street E., Toronto 1.)

MP **QUALITY GEARS CUT TO ORDER** MP

• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

MP **MEISEL PRESS MFG. CO.** MP

946 Dorchester Avenue Boston, Mass.

are you missing any?

Bring your files up to date with this reprint offer. *American Machinist* Special Reports on a wide variety of metalworking subjects are still available in limited quantities. To make sure you get copies of any you may have missed, check the list below, write your name, address, title, and company connection in the margin, and send this handy order form to us with your remittance.

SEND FOR ANY ONE OR ALL OF THESE AUTHORITATIVE SPECIAL REPORTS — 10¢ EACH

- ☐ *How to Lubricate Metalworking Machines*
- ☐ *War Turns a Page in Metal Processing*
- ☐ *War Turns a Page in Machining*
- ☐ *Non-Destructive Testing Methods*
- ☐ *Modern Materials-Handling Methods*
- ☐ *How to Work Magnesium Alloys*
- ☐ *Electric Control for Metalworking Machines*
- ☐ *How to Cut Costs of Plastics Molds*
- ☐ *Forging Practice*
- ☐ *Apprentice Training*

Selection and Application of

- ☐ *Single Point Tools*
- ☐ *Twist Drills*
- ☐ *Fastening Devices*

Readers' Service Department

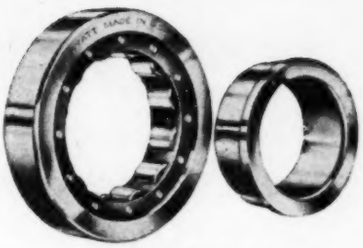
AMERICAN MACHINIST

330 West 42nd Street New York 18, N. Y.

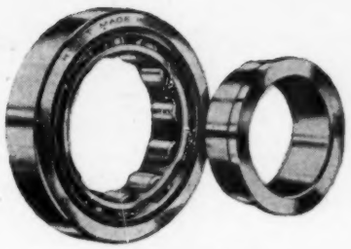
APPLICATION ADVANTAGES OF HYATT HY-LOAD ROLLER BEARINGS

Q *When a radial bearing must also locate the shaft, what's the solution?*

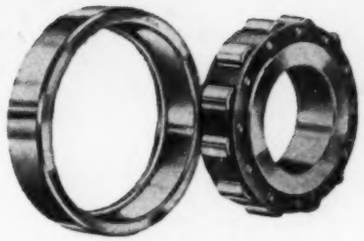
A *Any one of the five Hyatt Hy-load flanged race bearings.*



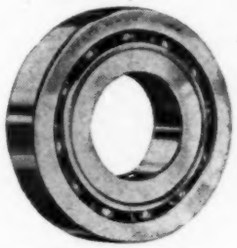
TYPE R-WB—WITH SEPARABLE INNER RACE



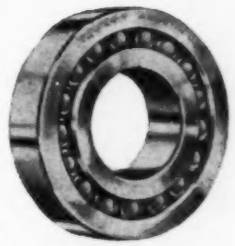
TYPE R-YS—WITH SEPARABLE INNER RACE



TYPE BU-L—WITH SEPARABLE OUTER RACE



TYPE U-YS NON-SEPARABLE UNIT



TYPE U-YM NON-SEPARABLE UNIT

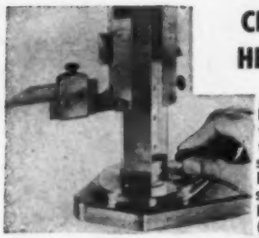
You will find a Hyatt Hy-Load Roller Bearing designed to meet practically every application requirement.

The Hy-Load Bearings illustrated were designed for the many applications where the bearing load is primarily radial—but where some provision is needed for axial shaft location. These Hy-Load Bearings serve that double purpose and, when used in pairs, they can locate the shaft in both directions. This is just one of the many advantages enjoyed by designers who know the Hy-Load line, which includes ten major types.

Investigate! Ask for the latest Hyatt Hy-Load Bearing Catalog and take full advantage of our Engineering Service. If you have a difficult bearing application problem, our engineers can supply the answer. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

SCHERR *aids to precision – production*

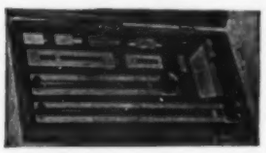


CHESTERMAN HEIGHT GAGE

A big, sturdy stabilized instrument which can double the output of your skilled toolmakers. Fine adjustment by screw operated from knurled nut on base (see photo) eliminates all chance of rocking or shifting instrument while measuring. Finger pressure on two lugs frees split nut for rapid up or down adjustment of the head. 2½" long vernier in place of the normal 5/8" vernier provides greater visibility without the need of magnifier or removing gage from work. Both English and metric readings one on each face of column. Made in sizes from 12" to 48"—capacities sufficient for the most unusual measurements.

OPTI-FLAT GLASS SURFACE PLATE

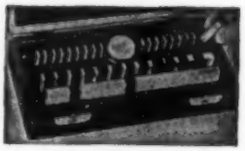
Here is the basis for vertical measuring accuracy—an optically ground glass surface, flat within 50 millionths over the total area. A solid, non-warping, thick disc of Pyrex brand glass, set in a heavy wood base with dustproof cover. Immune to the internal strains which may affect the accuracy of metal surface plates, with the added advantage that accidental scratches cannot cause raised burrs, nor long usage wear the hard surface. For real accuracy in layout work and critical inspection, start from the perfect surface of a Scherr Opti-Flat. Two sizes—12" diam., 2" thick, and 16" diam., 3" thick. Also a complete stock of hand-scraped metal surface plates, angle irons, measuring irons, etc.



GAGE BLOCK UTILITY SET

Quick adjustable type holders. Greatly expands the usefulness of any set of standard gage blocks. The complete set includes four holders—2", 4", 8" and 12", two jaws each for inside and outside measurements, a 60 deg. center point, a scriber point, and a substantial height gage base. Holders have no long projecting screws to make handling awkward. Every shop can profitably use one or more of these economically-priced sets, which will save their cost many times over by applying gage block accuracy at first hand, allowing for no variation through the use of any other tool. Any parts of this set can be furnished separately at moderate cost.

ULTRA-CHEX GAGE BLOCKS



The last word in modern basic accuracy brought within the grasp of all shops large and small. Sets in size for all budgets. All blocks accurate to five millionths. Illustrated is the 34-block set, giving 80,000 combinations in steps of 1/10,000", with optical flat for checking wear. Low prices allow for constant practical shop use in setting tools, checking gages, locating holes in jigs and fixtures, etc. Many shops use a number of sets, with one master set for reference.

Write for full details on these tools, and for the Scherr Small Tool Catalog.

GEO. SCHERR CO., Inc.
200-D Lafayette St. New York 12, N.Y.

The Fight Against Friction!

"How To Lubricate Metalworking Machines" — one of the most popular Special Reports ever run in *American Machinist* — has been reprinted! Copies are available in reasonable quantities.

This 16-page survey on an ever-important subject tells, with text, tables, and technical illustrations, about lubricants, their sources and compositions, their most efficient use, and their care and handling. Special sections describe the leading tests for lubricants and give the story on what's ahead in the lubrication field. A table describes general lubrication recommendations for machine tools including parts to be lubricated, grade of lubricant that should be used, and a description of the qualities necessary.

If you would like copies for your technical or field staff, please write giving the number required and enclosing 10¢ each for costs of handling and mailing.

FOR COPIES WRITE:

Readers Service Department

AMERICAN MACHINIST

330 WEST 42nd STREET

NEW YORK 18, N. Y.

GORHAM
is a name to remember
GORHAM
—when you're thinking of "special" tools
"Special" in more than the usual sense of the word are these cemented carbide cutting tools by GORHAM. Whatever your needs in custom-built tools, the name GORHAM means highest quality. Our engineers are experts in the design, application and manufacture of carbide-tipped cutting tools. When you want a "special" tool for a special job, call GORHAM to solve your problem. Our long experience in the field will help you do the job faster, better, more economically. The facilities of our modern plant are at your disposal.
GORHAM TOOL COMPANY
14400 WOODROW WILSON AVE. • DETROIT 3, MICHIGAN

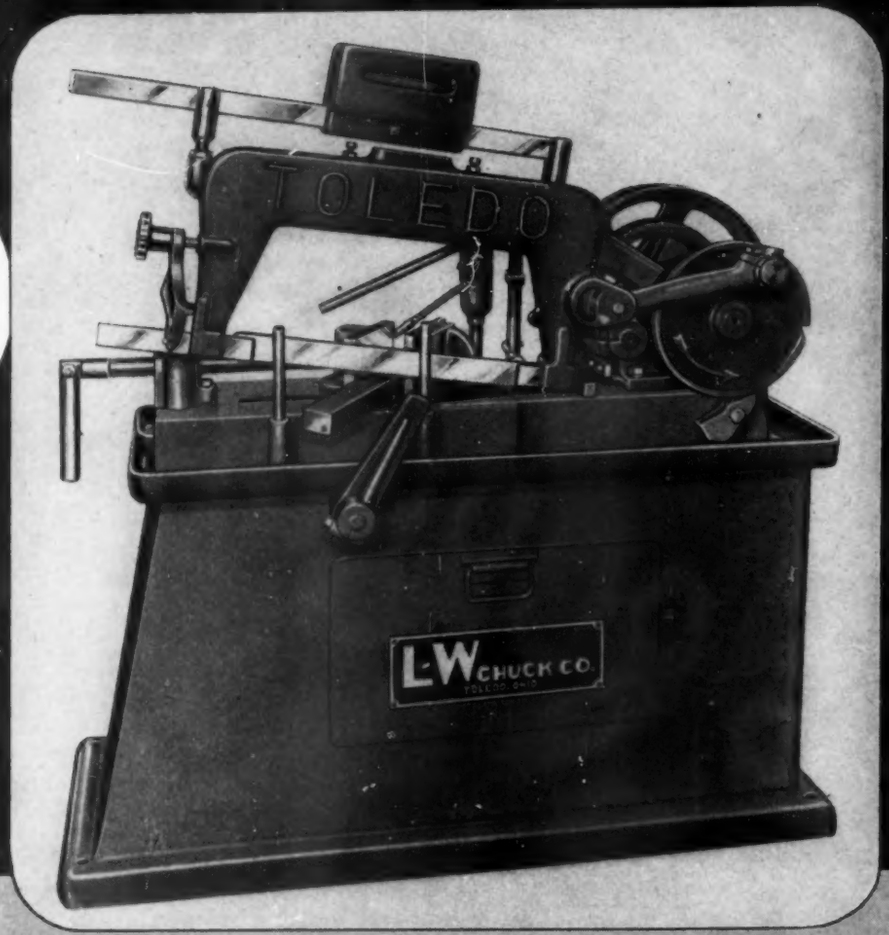
LW

NEW MODEL HIGH SPEED

POWER HACK SAWS

ONLY

$225.15



All steel welded base and table top
Belt drive
Rigid frame
Gravity feed
Length gauge
Expanding clutch
Swivel Vise

•

3-speed (90 to 130 r.p.m.) V-belt motor drive arrangement, which assures maximum power transmission efficiency . . . $25.90 less motor. ½ H.P. 1725 r.p.m. motor recommended.

● Stops automatically on completion of cut. ● Automatic relief of saw blade on non-cutting stroke. ● 6" x 6" capacity using 10" x 14" blades. ● 12" x 3" clutch pulley. ● Pulley speed 120 r.p.m. ● Coolant pump inside of base. ● Swivel vise permits cutting at various angles. ● Sliding bearing is dovetailed to fit arm and is adjustable in all directions.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY

25 SO. ST. CLAIR ST.
TOLEDO 4, OHIO

weld low alloy steels...

with electrodes "CUSTOM TAILORED" for the job

In Airco's complete line there are three electrodes designed specifically for the welding of low alloy, high tensile steels. These shielded arc electrodes can be used on A.C. or D.C. and produce welds of exceptional appearance and soundness.

Airco Nos. 382, 383 and 395 (A.W.S. classification E7011, E8011 and E9020) give sound, high quality welds of good appearance and high mechanical properties. Their strong, steady arcs produce a large quantity of fluid slag which completely covers the weld under most conditions. All are known for their low spatter, high deposition efficiency and good penetration, and are recommended for specific services. Airco No. 382, for example, is extremely well-known for welding carbon-moly steels as used in the pressure piping industry because of excellent creep resistance at elevated temperatures.

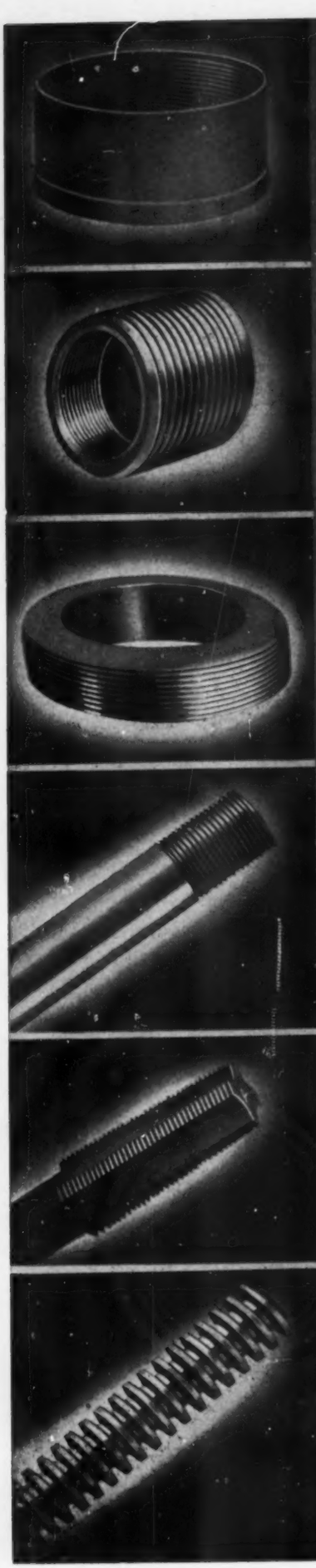
Complete information about these and the rest of Airco's complete line of electrodes is available in Catalog 120A. For your copy, fill in and mail the coupon. Address: Air Reduction, General Offices, 60 East 42nd St., New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, General Offices, Houston 1, Texas. Represented Internationally by Airco Export Corporation.

AIRCO **AIR REDUCTION**
Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and other Gases . . . Carbide . . . Gas Welding and Cutting Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

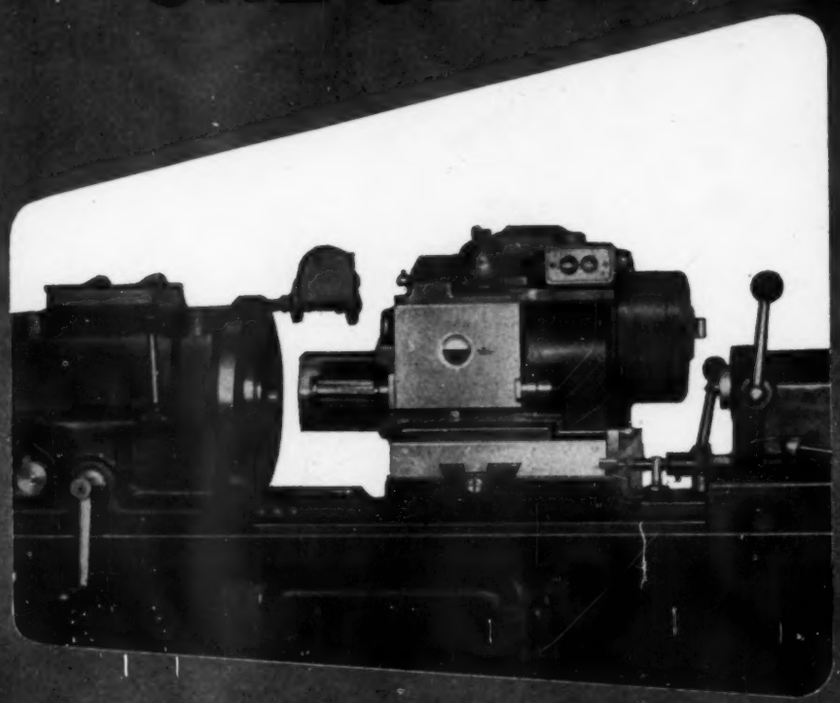
AM
Air Reduction
60 East 42nd Street
New York 17, N. Y.
Please send me the Airco Electrode Catalog No. 120A.

Name.....
Firm.....
Address.....
City..... Zone..... State.....
II



YOUR THREADING JOB MAY BE

ONE OF SIX



If it is versatility you are looking for, Hanson-Whitney Thread Milling Machines have it. Whether the job calls for external or internal threads; right or left hand threads; straight or tapered threads a Hanson-Whitney does it automatically . . . without lost motion or reliance on the human element. The thread cutting control is entirely mechanical. Accuracy can be held to close tolerances . . . production is stepped up and costs are lowered. Our engineers are always ready to help you find new ways to improve your thread milling production. For further information, write: The Hanson Whitney Machine Company, Hartford, Connecticut.

Hand it to

Hanson-Whitney

MACHINE COMPANY

HARTFORD, CONNECTICUT

ALMA WANTS YOUR BUSINESS

- Job Machining
- Production Machining
- Automatic Screw Machining
- Heat Treating—Welding
- Tools—Jigs—Fixtures—Gages
- Special Machinery
- Designing—Engineering
- Parts—Made to Order in Volume
- Products Wanted—To Manufacture
- Accurate Work—Prompt Delivery

CONFIDENTIAL HANDLING OF ALL INQUIRIES

ALMA MOTOR COMPANY
OFFICE: 1434 NATIONAL BANK BLDG.
DETROIT 26, MICHIGAN
Telephone: Woodward 5-0643

SCREW MACHINE SPECIALISTS

- 1/32" to 1⅝" Dia. Cap.
- Brown & Sharpe Automatics Acme-Gridley Mutiple Spindle Automatics
- Hand Screw Machines
- Equipped for All Secondary Operations
- Send Prints or Samples for Prompt Quotations

C. H. HOPPER MACHINE CO.
1935 UNION RD.
GARDENVILLE, N. Y.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

CONTRACT WORK

OPEN SCREW MACHINE Capacity in the Southwest

Manufacturer of trade marked products has open capacity on 2⅝" capacity Acme Gridley 8 spindle Automatic, Brown & Sharpe Automatics, and equipment for secondary operations. Ample space for assemblies or sub-assemblies in modern plant.

NATIONAL GAS EQUIPMENT CO., INC.
TERRELL, TEXAS

Specialists in
CENTERLESS GRINDING
TO CLOSE TOLERANCES

Thrufeed, Infeed, Profile, Bar Grinding } on plastics, ferrous and non-ferrous metals

IMMEDIATE DELIVERY
ALL WORK GUARANTEED
GENERAL GRINDING COMPANY
302 Bruckner Boulevard, New York 54, N. Y.

METAL STAMPINGS IN SMALL LOTS

DAYTON ROGERS *Manufacturing Company*
Minneapolis (7), Minn.

ACCURACY • ALL METALS • UNIFORMITY

Specialists FOR OVER 50 YEARS IN Screw Machine Products of 1/32" to 1 1/16" diameters

WALTHAM SCREW COMPANY
79 RUMFORD AVENUE
WALTHAM, MASS.

QUICK DELIVERY • ALL THREADS • DEPENDABILITY

THE METOMIC CORP.
wishes you
A MERRY CHRISTMAS
and
HAPPY NEW YEAR
Manufacturers of Screw Machine Products
2944 W. 26th ST. CHICAGO 23, ILL.

THREAD GRINDING

Accurate Lead *Send Print*
Universal Thread Grinding Co.
579 Lafayette St., Bridgeport, Conn.

REPLIES (Box No.):
Address office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT : BUSINESS : "OPPORTUNITIES" : EQUIPMENT : USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

60c per line, minimum 4 lines. To figure advance payment count 5 average words as a line.

Positions Wanted (full or part time individual salaried employment only) ½ the above rates payavble in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display and advertisements.

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

POSITIONS VACANT

A WELL established organization in New Jersey, near New York City, is looking for the services of a competent machinist for experimental work. Applicant should be able to use his own initiative, although working under direct supervision of Plant Engineer; must be well experienced on all machine tool operations; read blueprints and be able to make simple designs. If you feel qualified and are a reliable and steady worker apply by letter, stating particulars, such as experience, references, age, wage, desired, etc. Address P-3121, American Machinist.

SELLING OPPORTUNITY OFFERED

NAKTIL CORPORATION, Agents and distributors, Kawlbagh, New Delhi, desires to represent reliable manufacturers on sole selling agency or distributorship lines for ball bearings, steel balls, electric motors, machinery, and machinery parts, and tools of all kinds. Cable address, "Naktil", New Delhi.

— PROFESSIONAL SERVICES —

CHILDS & CO.

Product design & styling. Industrial & machine design. Jig, Tool & Fixture design. Plant layout & production problems.

P. O. BOX 457 CONNEAUT, OHIO

WANTED MACHINE TOOL DESIGNERS

For Layout Work. Good Educational Background with at Least Five Years' Experience Required.

THE MONARCH MACHINE TOOL CO.
SIDNEY, OHIO

REPRESENTATIVES WANTED

Since 1938 engaged in the designing of tools, dies, die cast dies, special machines, products, processing, time study, plant layout; and assisting in having built, expediting, and inspecting this equipment. Wishes to secure services of sales representatives in various cities handling similar but non-competitive accounts.

SPECIAL ENGINEERING SERVICE, INC.
8161 Livernois Avenue
DETROIT 4, MICHIGAN

SALES EXECUTIVE AVAILABLE
TWENTY YEARS EXPERIENCE

Proven ability energetic 42 year old Machine Tool Sales and Advertising Executive seeks new opportunity with well rated progressive Production Machine Tool or Accessory Manufacturer. Experienced both Direct Selling and Dealer Type Representation.

PW-3255, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

GEAR CUTTERS

NEW — H.S. STEEL • FIRST QUALITY

INVOLUTE 1P to 48P } *ALL LISTED*
BEVEL 3P to 24P } *PITCHES*

LESS 50% DISCOUNT

SEND FOR OUR BARGAIN CIRCULAR

DeWITT TOOL CO. 173 Grand St., N. Y. 13, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-seven years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITION WANTED

CHIEF INSPECTOR, age 37, outstanding ability, leadership, experience and references. Worked up from bench to manage inspection activities in aircraft plant of 30,000 workers. Mechanical engineering training at Texas A & M. Broad ASTM and other code experience. Graduate training in Administration, executives program of Harvard University. United States or Latin America. Principals only. PW-3076, American Machinist.

GEAR AND Production engineer, 12 years' experience in gear engineering, tooling processing and misc. production of jobbing, machine parts. PW-2185, American Machinist.

EXECUTIVE—MECHANICAL Engineer. American, 51, wide experience manufacturing machine-tools, tools, gages, general machinery; designer, superintendent, works manager, import, export, practical experience Europe, Far-East, linguist, seeks position with machine tool builder as manager office Metropolitan Area or similar occupation in administration. Abroad not excluded, right, durable connection most important. PW-3268, American Machinist.

BUSINESS OPPORTUNITY

Required immediately for India

complete plants for manufacturing (a) Crown Corks, (b) Sewing Needles, and (c) Nibs. Please contact BO-3136, American Machinist.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommel, Registered Patent Attorneys. Suite 453, 815-15th Street, N.W., Washington 5, D. C.

BLISS #6 HEADERS

New Brit. Grid. No. 412 Auto. Chuckers (3)
Foote-Burt 9 sp. Hyd. Drill, fixed spindles, No. 4 and No. 5 M.T. (5)
Rigid Turner 8 sp.
Lees-Bradner Model 40 Thread Millers
P&W—2 sp. Hor. Deep Hole Drill
Lapping Machines. Ultra Lap No. 20 (4)
Engine Lathe, 32"x14' Alliance G.H.
Turret Lathes, Denver Acme Model 6.2 (6)
Engine Lathe, 48"x32' Niles
Boring Mills—Vertical and Horizontal

CONTINENTAL SALVAGE
& MACHINERY CORPORATION
1836 EUCLID AVENUE, CLEVELAND 15, OHIO
MAIN 4402

USED STEAM DRIVEN GENERATORS

FOR SALE—2 G. E. GENERATORS, 200 KW at 250 volts DC, type MP, form L. Each is direct connected to a Ball-Wood Engine, 300 HP, tandem compound, 150# pressure, equipped with live steam vertical receiver, separator, throttle valve and exhaust valve.
ALSO—2 SWITCHBOARD PANELS, each with circuit breaker, field rheostat, ammeter, watt hour meter, voltmeter plug, and three pole 2000 ampere main switch.
All equipment is in good operating condition.

E. W. BLISS COMPANY
450 Amsterdam Detroit 2, Mich.

A.C. MOTORS AND GENERATORS

1½, 2 & 3 Horse Power sizes only, single phase Repulsion Induction, 110-220. Also totally enclosed 3 Phase Motors 1½, 2, 3 & 5 H.P. Mfrs. of A.C. Generators, Rotary Converters, Lighting Plants, Frequency Changers and High Frequency Generators.

KATOLIGHT
1423 First Ave Mankato, Minn.

FOR SALE
MILLING MACHINES

Six #000 Brown & Sharpe Brand New, Original Crates With 220 Volt 60 Cy. 3 Ph. Motors.

E. M. OLDACH CO., INC.
BOURSE BUILDING PHILA. 6, PA.

WILL TRADE

Have a number of 1" 6 spindle type RA *National Acme Automatics* like new *will trade for following;* 36" Van Norman *milling machine, Do all Saw,* 42" *Bullard,* 2A Warner & Swasey, #4 *milling machine, horizontal boring machine*—must be in good condition as our automatics.

NYLEN PRODUCTS COMPANY
ST. JOSEPH MICHIGAN

WANTED

MOTOR GENERATOR WANTED

100 to 200 KVA GENERATOR, 220-440 volt, 60 to 180 cycles.

150-300 H.P. SYNCHRONOUS MOTOR, 220-440 volt, 3 phase, 60 cycles for above generator drive.

R. O. BERG
MICHIGAN STEEL TUBE PRODUCTS CO.
9450 Buffalo Street
DETROIT 12, MICHIGAN

WANTED

1—18"x10' centers geared head engine lathe.
1—14" or 16"x54" centers geared head engine lathe.
1—11"x3' radial drill.
1—36"x10' to 12' open side planer.

Must be modern and in first class condition.

WHALEY ENGINEERING CORP.
P.O. Box 1336 Norfolk, Va.

WANTED

Bullard Vertical Turret Lathe 42" Spiral Drive—Prefer Serial No. above 22,000.

WESTBROOK ELEVATOR MFG. CO.
Danville, Va.

We are in urgent need of

Thread ball and reel making machines, hosiery machines, and typewriters in Indian language (Hindi).
Reliable manufacturers or suppliers are requested to contact *Agents and Distributors*

NAKTIL CORPORATION
Karolbagh New-Delhi
Cable address "NAKTIL" New-Delhi.

WANTED
OVERHEAD CRANE

7½ ton Overhead Traveling Crane adaptable to 71'-4½" span, 25 ft. lift, 4'-10" truss clearance, 440 V., 3 Ph., 60 Cy. current. Must be less than ten years old. Equivalent to P. & H. or Northern cranes.

REVERE COPPER AND BRASS INCORPORATED
Michigan Division, Detroit 9, Michigan

WANTED
VERTICAL BORING MILL

96" to 120" swing, 2 swivel rail heads, one right hand side head. Must be in first class condition.

DRESSER MANUFACTURING DIVISION
BRADFORD, PENNSYLVANIA

BUY FROM STOCK
Telephone
MAIN 6347-6348

FALK
MACHINERY COMPANY

18 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

AUTOMATICS

#0 & #00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle

1—#515 National Acme 9/16" 4-spindle Automatics, complete

ENGINE LATHES

32"x28' Bridgeford, Geared Head
32"x16' Bridgeford, Geared Head
28"x10' Davis, Quick Change Gear
26"x18' Bridgeford Geared Head
24"x36' New Haven, Motor Drive
24"x22' Lodge & Shipley, Geared Head
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G.
20"x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x10' American Geared Head
18"x10' Davis, Q.C.G. M. Dr.
18"x8' Lodge & Shipley geared head
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, MD.
16"x8' Hendey, Q.C.G. M. Drive
16"x6' Lodge & Shipley Geared Head
14x8' Rockford, Q.C.G. Collets
14"x8' Pratt & Whitney, Q.C.G. Collets
14"x6' LeBlond, Q.C.G. M. Drive
14"x6' American, Q.C.G. M. Drive
14"x6' Mulliner-Endlund, M. Drive
14"x6' Hendey, Q.C.G. M. Drive
14"x6' Rockford, Q.C.G. M. Drive
12"x30" American, Wood Spinning
12"x5' Sidney, Geared Head
12"x5' Hendey, Q.C.G. M. Drive
12"x3' Craftsman, Bench, M. Drive
11"x4' Sidney, Q.C.G. Floor Type
11"x3' South Bend, Q.C.G. M. Drive
10"x24" Logan, Q.C.G. (new) in stock
9"x12" Sundstrand Mfg. Type
8"x18" Rivett Precision, Bench
9"x15" Porter-Cable, Production

TURRET LATHES

Morey #2 Geared Head, 1" Cap.
Simmons, Microspeed, 1" Cap.
W-Swasey, Univ. #4, 1½" Cap.
Gisholt #4, Univ. 2" Cap.
W-Swasey #2A, Univ. 2½" Cap.
Gisholt #5, Univ. 2½" Cap.
W-Swasey #3A, Univ. 3½" Cap.
Bullard 42" Vert. Turret

GRINDERS

#2 Cinci. Univ. Tool & Cutter
#1 B&S, 10x24, Univ. Cylindrical
"A" Norton, 10x18 Cylindrical
"A" Norton, 10x72 Cylindrical
"A" Norton, 10x84 Cylindrical
#2 Norton, 10x32 Univ. Tool & Cutter
#11 B&S 10x30 Cylindrical
#10 B&S 6x18 Cylindrical
#4 B&S Univ. 12x60 Cylindrical
#12 Greenfield, Internal Hydromatic
#70 Heald, Internal, Grinds 11" deep
#2 Cinci. 6x36 Univ. Cylindrical
#2 Cinci. Centerless, Motor Dr.
#51 Oliver, Drill Pointers, 1½" cap.
24" Blount Wet Grinder
Besley Dble. End Disc, 30" Discs
#2 B&S Automatic 6x18 Surface
96" Seybold, Knife Grinder
Blanchard #16 Vertical, M. Dr.
Gorton Dble. End, 18" Discs
Pratt-Whitney 14x36 Vert. Surface
Abrasive #33 Vert. Surface, Automatic
#2 B&S Face Grinder, M. Drive

SHEARS & METAL WORKING

Cerweco, 8'x12 ga. Brake
Wais & Roos, 10½'x¼" Gap Shear
Niagara, 6'x18 ga. Squaring Shear
Lown, 6'x16 ga. Slip Rolls, M. Dr.
Lennox Splitting Shear, ¾" Cap.
Lennox Bevel Shear, ¼" Cap. M. Dr.
Peckstow, Power Seaming Machine
Racine 6x6 Shear-Cut Hack Saw

MILLING MACHINES

#2 Van Norman Horiz. Knee Type
#3 Cinci. Vertical, Dial Type
#1M Kent-Owens, Horiz. Mill
#1½B Milwaukee, Dble. Overarm
#2B Milwaukee, Dble. Overarm
#3B Milwaukee, Dble. Overarm
#2B Milwaukee, Univ. Horiz.
#2 Cincin. Univ. Horiz.
Cinci. 36x72 Hydrotel
#2 Van Norman, Duplex Mill
#4 Cinci Vert. High Power
#2 Kempsmith, Horiz. Plain
#1 Kempsmith, Horiz. Plain
#5C Becker Vertical Mill
#3, #4, #5 Cinci. Horiz. Mills.
#31 Lucas, Horiz. Boring, 3" Bar
#0 Giddings & Lewis, Horiz. Boring Mill—3" Bar

DRILLING MACHINES

Natco #12, 20 Spdles. 3/16" Cap.
Natco #D6, 24 Spdles. 5/16" Cap.
Natco #D5, 14 Spdles. 5/16" Cap.
Fox #15, 54 Spdles. #1 m.t.
Minster #2D, Sgle. Spdle. Upright, compound table, #5 m.t.
Cinci-Bickford, 3½' arm, 9" col. Radial
Cinci-Bickford, 4' arm, 11" col. Radial
Cinci-Bickford, 5' arm, 13" col. Radial
Fosdick, 5' arm, 14" col. Radial
Cinci-Bickford, 6' arm, 15" col. Radial

SHAPERS & PLANERS

Pratt-Whitney Vert. Shaper, 6", M. Dr.
Logan 7" Horiz. Shaper, Motor Drive
Machinery Sales 16" Crank Shaper
Gould & Eberhardt 16" Crank Shaper
Gould & Eberhardt 24" Crank Shaper
American 24" Crank Shaper
New Haven 12" Vertical Shaper
Whitcombe, 24x24x6 Planer
Niles-B-P, Shaper-Planer, 20x20x24
Ingersoll Planer Type Mill 30x30x16
Betts, 120"x72"x35' Planer
Ingersoll Planer Type Mill, 30x30x12

POWER PRESSES

Standard #1 "A", 6 tons, floor type
Bliss #68C Double Action Press
Hilles & Jones #4 Single End Punch & S Shear, 48" Throat, equipped as Plate Shear with 18" Blades, Cap.—1¼" thru 1"
Bliss #18 O.B.I., 11 tons, 1½" str.
Bliss #76½B, Single Crank Geared Press, 7" Shaft, 3" Stroke with Air Cushion
Horton-Ackerly, 6 tons Bench Presses
Caldwell, 200 Tons, Hydraulic, Horizontal Wheel Press, 36" dia. Capacity
Lucas 15 Tons, Power Arbor Press
Bliss-Consolidated #163B, S.S. Dble. Crank Press—Bed 42"x24"—6" Stroke
Clearing 200 Tons, S.S. 10" Stroke
Federal #5 O.B.I. 49 Tons, M. Dr.
Michigan O.B.I. 36 Tons Cap.—2" Stroke
General 8 Tons, Flexible Power Press, M. Dr.
Ferracute #EG52 Geared Coining Press, 150 Tons Cap.—Up Moving Ram
Baxendale O.B.I. 11 Tons, 1½" Stroke
Zeh & Hahneman, Single Action Cam Press, Spring Return Type—35 Tons Capacity

LATHES

8"x15" Sundstrand, Model D
10"x22" Sundstrand, Model AA
12"x18" Lipe Carbo
12"x5' Sebastian
14"x6' Hendey
18"x6' American
20"x10' Lodge & Shipley
20"x25" Fay
22"x48" Centers Monarch (1942)
36"x30' Lodge & Shipley
50"x17' cc LeBlond

MILLING MACHINES

No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. High Power
No. 3K Milwaukee Vertical (1942)
24" Cincinnati Production
No. 2—18" Cin. Auto. R. and F. (1941)
No. 4—48" Cin. Hydro. Tracer Control (1942)
No. 5—48" Cin. Hydro. (1942)
No. 45—48" Cin. Hydro. Duplex Tracer (1943)
No. 56-90 Cin. Hydro. (1943)
No. 2 Hanson-Whitney Thread
4"x9" Hanson-Whitney Univ. Thrd. Miller
6"x20" Pratt & Whitney, Model C
6"x36" Lees-Bradner Thread Miller
4" Taylor & Fenn Spline, M.D.
24"x24"x12' Ingersoll Adj. Rail
54"x36"x10' Ingersoll Adjustable Rail
60"x48"x12' Ingersoll Adjustable Rail

DRILLS

24"—8 Spdl. Demco
No. 121 Baker

ReMANUFACTURED MACHINE TOOLS
(ORIGINATED BY US)
Reg. U.S. Patent Office

No. 217 Baker—(1943)
No. D-8 Colburn No. 6 M. T.
No. 2 LMS—26"—2 Spdl. L-G (1945)
No. 2LMS—14"—3 Spdl. L.G.
No. 2 LMS—20"—3 Spdl. L-G (1943)
No. 2 LMS—14"—4 Spdl. L-G
No. 2 LMS—26"—4 Spdl. L-G
No. 2 LMS— 26"—6 Spdl. L-G
No. 2—8 Spdl. Leland-Gifford
7'-15" Col. American Full Universal
7'-15" Col. Carlton, Motor on Arm

VERT. BOR. MILLS

34" King
42" Bullard New Era
72" Cincinnati
72" Niles Extra Heavy
84" Betts

HOR. BOR. MILLS

No. 31—3" Bar Lucas
No. 3A—3" Bar Universal
No. 360-F Giddings & Lewis (1942)
No. 560-F Giddings & Lewis (1942)

GEAR MACHINES

No. 7 Fellows Gear Shaper
11" Gleason Bevel Gear Cutter

PLANERS

36"x36"x12' Cincinnati, 4 Heads

MISCELLANEOUS

Model H-7 Micromatic Vert. Honer
2500 Ton Lake Erie Hydraulic Press
No. 22-C Racine Shear Cut Hack Saw

TURRET LATHES

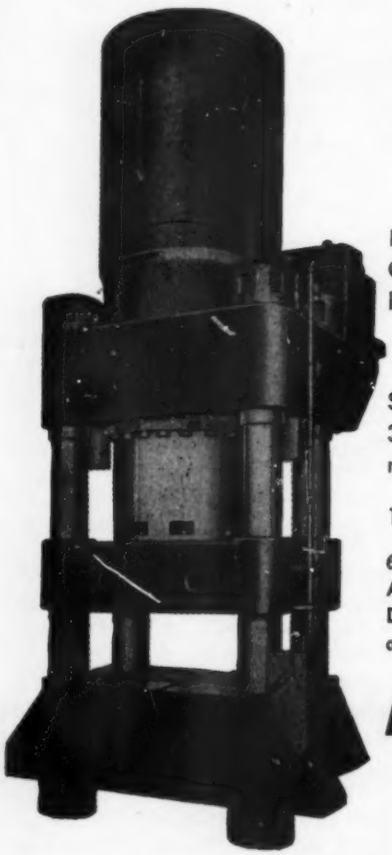
No. 2 B. & S. Screw Machine, Wire Feed
No. 601 Oster Rapiduction
No. 3 Jones & Lamson (1942)
No. 3 Bardons & Oliver, Bar Feed
No. 4 Gisholt (1942)
No. 5 Warner & Swaseys
No. 5 Bardons & Oliver
No. 5 Foster, A.C. & Bar Feed
2-A Warner & Swasey
5R Denver
18" Libby, 3½" H.S.
No. 49-675—New Britain Gridley—7½" Cap.

GRINDERS

6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x36" Norton Type C Plain (1943)
16"x72" Norton Type C Plain (1944)
Norton Motor Driven Plain Grinders 6"x18" to 24"x240"
10"x24" Landis Type C Universal
12"x36" Landis Type LCH Universal (1945)
12"x48" Cincinnati Universal
16"x16"x48" Thompson Hyd. Surface
No. 34 Abrasive Surface (1943)
No. 22—12" Heald Rotary Surface
No. 25A—16" Heald Rotary Surface (1942)
10"x72" Colonial Broach Grinder

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BLVD. CHICAGO 6, ILL.



1300 TON WATSON STILLMAN HYDRAULIC PRESS Self Contained

Platen size 48" x 42". Stroke 22". Opening 37. Ram Diameter 35". Driven by 50 H.P. Motor, Also

600 TON ELMES PRESS

Self contained 48x45" between rods, 36" stroke, 66" openings, 75 H.P. motor, 3 phase, 60 cycle, 220v.

1320 TON PRESS, SELF CONTAINED

600 Ton Self Contained Lake Erie Double Action Press with 175 Ton Cushion Cylinder. Distance between rods 48"x60", Stroke 30", opening 48".

Aaron Machinery Co.
Incorporated
45 CROSBY ST., N. Y. C.
Tel. CAnal 6-0421

REYNOLDS has the following in stock . . .

#500 Standard Automatic Drop Hammer, late model.

#800 Standard Automatic Drop Hammer with steel insert in bed and safety device with 220/3/ motor.

Heald #25-A 30" Rotary Surface Grinder, late model, new 1943.

Heald #70A Internal Grinder, late model, motor driven.

Reed #20 Cylindrical Die Roll Threader with 22 sets of dies.

REYNOLDS MACHINERY CO.
303 Eddy Street, Providence 3, R. I.
Gaspee 5187

LATEST TYPE NEARLY NEW MACHINES

AUTOMATIC SCREW MACHINES

BROWN & SHARPE #4, 1¼" capacity, latest type
CONEMATIC 1½", 8 spindle, latest type
CONEMATIC 3½", 4 spindle, latest type
NATIONAL ACME 9/16, 5 spindle, Model D, MD

BORING MILLS—Horizontal

DETRICK & HARVEY 4", 5" bar, Floor Type, M.D.
EXCELLO #2113A, #112C single end, 2 spindles, Borers, latest type
GIDDINGS & LEWIS #32, 3⅛" bar, M.D.
HEALD #46B, #48A, #49 single and double end Borers, latest type
LUCAS #31, 3" bar, motor drive
LANDIS #35, 3½" bar; Floor Type
NILES BEMENT POND 4½" bar, Motor Drive
NILES BEMENT POND 5", 6", 7" bar, floor type
UNIVERSAL 3" bar, high speed, latest type

BORING MILLS—Vertical

BETTS 120", 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, latest
BULLARD 16" 6-spindle Type D Multimatic; latest type
BULLARD 24", 36" Vertical turret, Spiral Drive, Latest Type
BULLARD 54" Maximill, 2 swivel hds., M.D.
BULLARD 24", 36" vertical turret, M.D., New Era
KING 36" Vertical Turret, M.D., Latest Type
NILES 62", 73", 100", 2 swivel heads, PRT; M.D.

BROACHES

LaPOINTE #4L, Horiz. Hyd., latest type
LaPOINTE SRV-10-54, 25-66, Vert. Surf. Hyd., latest

DRILLS—Multi. Spindle

BAUSH #3, 4 Adj. multiple spdl., M.D.
FOOTE BURT 20 spindles, latest type
KINGSBURY 4 spindle Model GC, latest type
NATCO #4BL adjustable, hydraulic, 36 spindles, latest
NATCO D5, D6 adjustable multiple Latest Type
PRATT & WHITNEY #12 Adj. multiple spdl., M.D.

DRILLS—Sensitive

ALLEN #1, #2, #3, latest type
AVEY #2, #MA6, 1, 2 & 3 spindle, latest type
BARNES #H3 Hydram, heavy duty, hydraulic, latest
BUFFALO #4, latest type
EDLUND #1B, #2B, #2MS, 1 to 3 spindles, latest type
FOOTE BURT #2, #3, single spindle, latest type
LELAND-GIFFORD #2MS, #2LMS, 2, 3 & 4 spindles, latest type

DRILLS—Radial

AMERICAN 3¼'9", 5'13", plain, motor drive
CANEDY OTTO 4'11" plain, latest type
CARLTON 6'15", motor on arm
CINCINNATI BICKFORD 6'15" plain or uni. M.D.
DRESES 5'13" plain or universal, motor drave
FOSDICK 5'14" motor drive
FOSDICK 6' arm 19" column, Economax, Hyd., Latest Type
NILES 6' Universal, motor drive
REED PRENTICE 6' plain, motor drave
WESTERN 5'18", 6'20", latest type

GEAR CUTTING EQUIPMENT

BARBER COLMAN No. 3 hobber—latest type
BROWN & SHARPE No. 3H gear cutter, M.D.
CROSS #73 Chamfering; latest type
FELLOWS #615A, #61, #645A3, #7A, #72, #75A, #77 High Speed Gear Shapers; latest type
FELLOWS #8M Red-liner Gear Tester, latest type
FELLOWS #12M Involute Measuring Instrument, latest
FELLOWS #6Z2 Gear Shaper; high speed; latest type
FELLOWS #13LS Lapper, latest type
GLEASON 3" straight Bevel Generator, latest type
GLEASON 10", 15" Spiral Bevel Generator, md
GLEASON 11", 18" Straight Bevel Generator, md
GLEASON 12" straight bevel generator, Latest Type
GLEASON #16 Spiral bevel, hypoid, Latest Type
GLEASON #7 Spiral bevel, hypoid, Zerol, Latest Type
GLEASON 36" Straight Bevel Planer, MD
GLEASON #4, #6, #13, #18 Bevel and Hypoid Tester
GOULD & EBERHARDT #12H, #24H, #36H, #48H Hobbers, latest type
GLEASON 36" str. bevel gear planer, M.D.
MICHIGAN #1124 "Sine-line" Involute Checker, latest type
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUHARDT & SCHUTTE #1, #2 with diff., M.D.

GRINDERS—Cyl.—Plain & Univ.

BROWN & SHARPE #1, 2, 3, 4, Universal, Latest
BROWN & SHARPE #5 Plain, 3 x 12, Latest Type
BROWN & SHARPE #20, 10x18 plain, latest type
CINCINNATI 6x18 plain Model EA, hyd., latest type
LANDIS 6x18, 10x18, Type C, hydraulic, latest
LANDIS 30"x220" centers, motor drave
NORTON 10x18 Type C, hydraulic, latest
NORTON 10x36, Type C, 45° angle wheel, latest
NORTON 16x72 Univ., hyd., Type C, Latest
NORTON 16x72 Plain Type "C", latest type

GRINDERS—Miscellaneous

BARBER COLMAN #3 Hob sharpener; latest type
BROWN & SHARPE #13 Universal & Tool; latest type
BRYANT #5, #16-16, #16-CP-16, Internal, Hyd. latest
CINCINNATI #2, Centerless; latest type
CINCINNATI #2 Universal Cutter & Tool; latest type
CINCINNATI #3 Centerless, Motor Drive.
FITCHBURG 14"x25" Spline, hydraulic, latest
HEALD #50 Internal, Hydraulic, MD
HEALD 75A, 72A5, 81 Internal; latest type
JONES & LAMSON 6x15, 8x48, Automatic Thread Grinder, latest
LEBLOND #2 Universal Tool & Cutter, latest type
OLIVER #510 Drill Grinder, latest type
SELLERS #30W Drill Grinder, latest type

GRINDERS—Surface

ARTER 30" Rotary, hydraulic, latest type
BLANCHARD #16, 24" chuck, M.D.
BLANCHARD No. 16A—Dial Type—motor drive
BLANCHARD #27-18 M.D., Latest Type
BLANCHARD #11, 16"; latest type
G. & L. #35, 8x24, hyd., Latest Type
G & L #55, 12x36 hyd. latest type
HANCHETT #300 series, vertical 13x48, latest type
HEALD #22 Rotary, 12" chuck, latest type
HEALD #25A Rotary, 16" chuck, hydraulic, latest type
MATTISON 12x16x60 hydraulic, latest type
MATTISON 14x16x60 hydraulic, latest type
NORTON 6x18 Hydraulic; latest type
NORTON 10x36 hydraulic, latest type
PRATT & WHITNEY 8" Rotary, MD
THOMPSON 8x12x24 hydraulic, latest type
THOMPSON 16x30x48 hydraulic, latest type

LATHES—Engine and Mfg.

BETTS BRIDGEFORD 60"x24' bed (swing 84")
BRIDGEFORD 36"x28', 36"x32' bed—2 carriages
JONES & LAMSON "Fay" 20x25" automatic, latest
LeBLOND 13x4', 17x5' bed, Rapid Production, Timken Bearing, Latest Type
LEHMANN 16x30" centers, TIMKEN, latest type
LODGE & SHIPLEY 16/20x30" centers, Timken, Latest
LODGE & SHIPLEY 18x72" centers—Motor Drive
LoSWING 4x60, 4x84, 8x60, 8x108, 5x34, Latest
MONARCH 12x30" centers; Timken; latest
MONARCH 36x108" centers; Timken; latest
MONARCH 16x28" geared-head, M.D.
MONARCH 10"x20" centers, Model EE, Timken, latest
N.B.P. 48x32' centers, 2 carriages, PRT, M.D.
N.B.P. 48x63' centers, 87' centers, combination turning and boring, M.D.
NILES 42"x60" double head, motor drive
NILES 48x35', centers, heavy Duty, 2 carriages, Timken Bearing, PRT, Latest Type
NILES 60x10' centers, heavy duty, PRT, Latest Type
NILES 60x35' centers, heavy duty, 2 carriages, PRT, Latest Type
NILES 72"x62' centers, combination Boring and Turning, Motor Drive
NILES 30x50' Boring, Timken, Latest Type
PRATT & WHITNEY 1/2Bx30", and 50", 2 spindle, Deep Hole Drill, latest
REED PRENTICE 20x54" centers; Timken; latest
REED PRENTICE 16x24" centers, geared head, M.D.
SPRINGFIELD 14"x6' bed, geared head, M.D.
SPRINGFIELD 16"x6' bed, geared head, M.D.
SUNDSTRAND 8x15 Style D, 12x22 Style B, Automatic, Stub, latest
WARD, HAGGAS & SMITH 18/30x10' bed, gap

LATHES—Turret

CINCINNATI ACME No. 1, No. 5W, Timken, Latest
GISHOLT #3, 5, Univ. Timken Bearing, Latest Type
GISHOLT #1L, #2L, Universal, Timken Bearing, Latest Type
JONES & LAMSON #3, #7C, #8A Univ., Timken Bearing; latest type
LIBBY No. 1H-5 Timken Bearing—latest—5½" hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON 5DE, 5D2E, Automatic, Timken, latest
WARNER & SWASEY 3A, Univ., 6" hole, bar or chucking, Timken Bearing, Latest Type
WARNER & SWASEY #1A, #4A Univ., Timken; latest

MILLING MACHINES—Mfg.

CINCINNATI 24", 48" duplex, TIMKEN, M.D.
CINCINNATI 3-24 Duplex, Hydromatic, Timken, Latest
HALL Style D, Planetary, latest type
INGERSOLL 32x24x10' Planer Type, 2 heads, AC, M.D.
INGERSOLL 32x30x12' combination Planer and slab, Motor Drive
PLAN-O-MILL #3, latest type
SUNDSTRAND Model 3A Duplex, latest type
TAYLOR & FENN M80 Duplex Spline, latest

MILLING MACHINES—Plain

BROWN & SHARPE #12 Timken Bearing, Latest Type
CINCINNATI #2, #4 Dial Type; Timken, latest
CINCINNATI 0-8 Automatic rise and fall, Timken Bearing, Latest Type
CINCINNATI #4 Timken Bearing, M.D.
CINCINNATI #4S, #5, M.D.
CINCINNATI 1-12, 2-24, TIMKEN, latest type
KEARNEY & TRECKER 1218, TIMKEN, latest
KEARNEY & TRECKER 1224—Timken—Latest
KEARNEY & TRECKER #2K Timken, latest type
KEARNEY & TRECKER #4 Heavy, Timken, M.D.
KEMPSMITH #2, #4 Maximiller, Timken, latest type
LEBLOND #4 heavy duty, MD

MILLING MACHINES—Universal

AMES Bench, MD, latest type
BROWN & SHARPE #2A, #3A, motor drive
CINCINNATI #3 Universal, Dial Type, Timken, latest
HARDINGE Model UM, Timken, latest
KEARNEY & TRECKER #3H, Timken, latest

MILLING MACHINES—Vertical

CINCINNATI #2, #3, #4 Dial Type; Timken; latest
CINCINNATI No. 3, No. 4 High-Powered, M.D.
GORTON 8D superspeed, latest type
GORTON 9J, with duplicator complete, latest
REED PRENTICE #5 die sinker, latest type
REED PRENTICE 3VG with Hydraulic Duplicator, Timken Bearing, Latest Type

PLANERS

CHANDLER 36x36x20', 4 heads, AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
DETRICK & HARVEY 84"x84"x18'; 4 heads; DC; M.D.
NILES BEMENT POND 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC, M.D.

SHAPERS

CINCINNATI 26" Travel Head—2 head type B
GOULD & EBERHARDT 24" "Invisible", Motor Drive.
LAMAIRE 18' Vert. Hydraulic—latest type
MOREY 8", 10", 12", 14" Vertical, latest type
MORTON 48" draw cut, M.D.
NEWTON 15" vert. slotter, DC, M.D.
NILES 18" vert. slotter, DC, M.D.
ORMEROD 8" Vertical, latest type
PRATT & WHITNEY 6", 10" Vertical, M.D.

MISCELLANEOUS

BIRDSBORO 325 ton vert. hyd. press
FERRACUTE DG-55, 75 ton Drawing Press; 17" stroke; latest type
MORTON 60" combination traveling hd., planer, miller and borer, M.D.
PRATT & WHITNEY 3B Jig Borer; latest type
PRATT & WHITNEY (KELLER) Type G Copying; latest type
PRATT & WHITNEY (KELLER) Type BL-2416 Copying, latest type
BARNES #172, #306H Vertical Hone, latest type
BAKEWELL #1 Tapper; motor drive
BILLINGS & SPENCER 1500 lb. Board Drop Hammers
GISHOLT 3U Dynetric Balancer, latest type
MARVEL #6A Hack Saw, latest type
TAYLOR & FENN #11A Spring Press, latest type

Available for Prompt Shipment ***Most Built After 1941***

(Partial List) Over 2,000 Machine Tools in Stock. Your Inquiries Are Invited . . . Prompt Service Is Assured

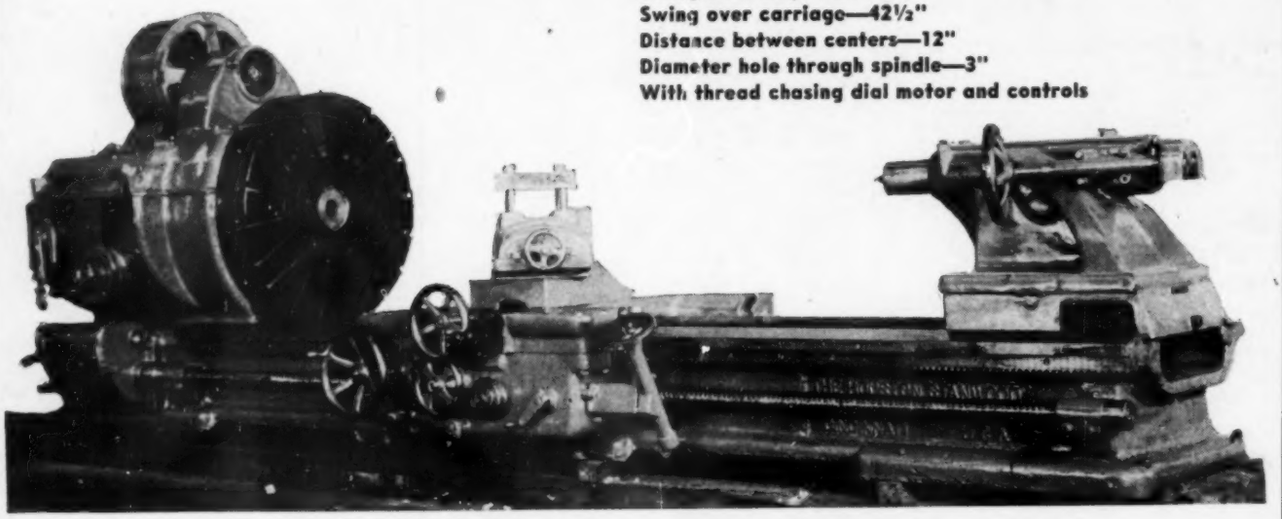
MOREY MACHINERY CO., INC.
410 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

EMERMAN Offers From Stock

Heavy Duty Engine Lathe

54" x 18' HOUSTON STANWOOD & GAMBLE

Swing over ways—54"
Swing over carriage—42½"
Distance between centers—12"
Diameter hole through spindle—3"
With thread chasing dial motor and controls



16' x 24' NILES BEMENT POND EXTENSION TYPE BORING MILL
2000 TON HPM. FASTRAVERSE HOBBING PRESS
NO. 2 MEDART-HUFF BAR & TUBE STRAIGHTENER

EMERMAN MACHINERY CORP. 875 W. 120TH ST. CHICAGO 43, ILL.

UNUSUAL VALUES

Milling Machines—#1, Universal, #1 American (new) plain, #1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe #3—20", Gould & Eberhardt 42".

Grinders—Cylinder, B & S #11, Planer type 16"x36", Surface 13"x62", also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14"x6', 8', 10'—16"x6', 8', 10'—18"x6', 8', 10'—26"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized. Large stock 10" and 12" bench and floor type.

Planers—Single head 24"x6', 24"x8', 26"x8'.

Shapers—16", 20", 24", B.G. crank.

Turret Lathes—J & L 2"x24"—3"x36" also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 36", 40".

SPECIAL—New totally enclosed, dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt #25—24" Hi Duty. 3" capacity in steel, motor attached.

PATTERN MAKING MACHINERY—12"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. BOX 88, COLUMBUS 16, OHIO

NEW SURPLUS

ARMSTRONG LATHE DOGS, BENT TAIL

¼"	$.50 each net
½"	.50 each net
¾"	.50 each net
1"	.50 each net
1½"	.50 each net
2"	.50 each net
2½"	.50 each net
3"	.50 each net
3½"	.50 each net
#11 Armstrong Bitch Dogs, opens to 1½"	.50 each net

12" Combination Squares with Bevel Protractors complete, Millers Falls, **$4.50** ea.

VICTOR MACHINERY EXCHANGE, INC.

251 Centre St. New York City
CAnal 6-5575

PRESSES

STRAIGHT SIDE—60 ton, 5" stroke, 48x24 bed, late model Waterbury Farrell (15).
90 ton, 8" stroke, 50x18 bed, Bliss (3).
200 ton, 32" stroke, 27x27 bed, Bliss
100 ton, 4 stroke, 21x21 bed, 15½" shut height, Bliss
70 ton, 4" stroke, 22x22 bed, 15" shut height, Toledo.
35 ton, 4, 5, 6" stroke, latest type, pract. new, w/all accessories, Bliss, $850.00 ea.
100 ton, 4" stroke, 21x27 bed, 110 strokes per min., Bliss.
115 ton, 4" stroke, 21x26 bed, $2250.00 (3).
INCLINABLE PRESSES, BRAND NEW — #21 ½A Bliss, brand new, w/cushions, 6" stroke, 18" shut height (3).
#5 Federal, brand new, 4" stroke, 38¾"x8" bed.
55 ton Walsh, brand new, 3½" stroke, 9" shut height.
15 ton, new $363.00; 4½ ton, new, $165.00.
HORN—50 ton, Bliss, 4½" stroke.
40 ton, Consolidated, 2" stroke.
35 ton, Toledo, 2" stroke.
5 ton Bliss, 1½" stroke.

AUTOMATICS

1⅝" Acme Gridley, 6 spdl. latest type (2).
2¼" Cone, 6 spdl., latest type (4).
16" 8 spdl. Bullard Multaumatics, pract. new, $9000.00 ea. (5).

BRAKE

10'x½" Henderson Power Press Brake, 30 HP motors and controls. Just taken out of operation.

SPOT WELDERS & BUTT WELDERS, Prompt delivery, 5300 KVA, Brand new, guaranteed.

PAUL'S MACHINERY COMPANY
6111 Vermont Avenue
Detroit 8, Michigan
TYLER 7-6300

MONA MEMBER

POWER SHEARS

96", 12 ga. cap.
72", 10 ga. cap.
52" & 72", 14 ga. cap.

Aaron Machinery Co., Inc.
45 CROSBY ST., N.Y.C. Tel. CAnal 6-0421

THE LARGEST MACHINE TOOL PLANT IN THE U.S.A.

Eastern OFFERS FROM STOCK

DEVOTED EXCLUSIVELY TO REBUILT MACHINERY

ENGINE LATHES

12"x84" centers Lodge & Shipley Selective Head, m.d., taper
13"x30" Pratt & Whitney Model B Geared Head, m.d., taper
13"x48" Pratt & Whitney Model B Geared Head, m.d., taper
14"x30" centers American Pacemaker, m.d., latest
14"x30" centers Lodge & Shipley, m.d., latest
14"x6' Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x6' Sidney Geared Head, m.d.
14"x8' Pratt & Whitney, cone
16"x30" centers Lodge & Shipley Geared Head, m.d., latest
16"x36" centers Pratt & Whitney Geared Head, m.d., taper
16"x6' Bradford, cone, taper
16"x6' Hendey Geared Head, m.d., taper
16"x6' Lodge & Shipley Selective Head, m.d.
16"x30" centers Monarch Geared Head, m.d.
16"x8' Lodge & Shipley Selective Head, m.d., taper
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d., taper
18"x8' Greaves-Klusman, cone, taper
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley, cone
18"x8' Whitcomb-Blaisdell Geared Head
19"x10' LeBlond Geared Head, m.d.
20"x8' Cisco, cone
21"x12' LeBlond, cone, taper
21"x18' LeBlond, cone
22"x70" centers Greaves-Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' American M.P., cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' Lodge & Shipley, cone
24"x144" centers American Geared Head, m.d., taper, latest type
24"x12' LeBlond, cone
24"x12' Reed-Prentice Geared Head, m.d., taper
24"x14' Boye & Emmes, cone, taper
24"x20' Lodge & Shipley, cone, taper
25"x10' LeBlond, cone
26"x16' Boye & Emmes, variable speed m.d., taper
27"x18' LeBlond Geared Head, m.d.
30"x12'6" Niles-Bement-Pond, m.d., taper
36"x12' Lehmann Hydratrol Geared Head, m.d., taper, latest
36"x21' centers Putman Geared Head, m.d.
36"x30' Lodge & Shipley Triple Geared Selective Head, m.d.
36"x32' centers Putnam Geared Head, m.d., 2 carriages
36"x28' centers Niles H.D. Geared Head, m.d., 2 carriages, latest
50"x204" centers Le Blond H.D. Geared Head, m.d., taper, latest

MANUFACTURING TYPE MILLING MACHINES

No. 00 Sundstrand Hydraulic Rigidmill, m.d., latest
No. 08 Cincinnati EA Plain Automatic, m.d., latest
No. 08 Cincinnati EA Plain Automatic, m.d., with rise and fall, latest
No. 1-12 Cincinnati Plain Automatic, m.d.
No. 1-18 Cincinnati Plain Automatic, m.d., latest
No. 2 Sundstrand Electromill, m.d., latest
No. 24 Milwaukee Simplex, m.d., latest
No. 2-24 Cincinnati Plain Automatic, m.d., latest
No. 2-24 Cincinnati Plain Automatic, m.d., with rise and fall, latest
No. 3-24 Cincinnati Plain Hydromatic, m.d., latest
No. 3-36 Cincinnati Duplex Hydromatic, m.d.
No. 3A Sundstrand Copy Rigidmill, m.d.
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, m.d., with tracer control, latest
No. 56-72 Cincinnati Duplex Hydromatic, m.d., latest
No. 56-90 Cincinnati Duplex Hydromatic, m.d., latest
4" Pratt & Whitney Spline, m.d.
18" Cincinnati Mfg. Type, m.d.
18" Cincinnati Plain Automatic, m.d.
24" Cincinnati Plain Automatic, m.d.
24" Cincinnati Duplex Automatic, s.p.d.
24" Cincinnati Duplex Automatic, m.d.
28" Cincinnati Plain Automatic, s.p.d.
48" Cincinnati Duplex Automatic, m.d.
Type P Ohio Mfg., m.d.
Hall Planetary Thread, m.d.
4½x12" Pratt & Whitney Thread, belt
6x14", 6x48", 6x80" Pratt & Whitney Thread, belted m.d.
6x20" type B Pratt & Whitney Geared Head Thread, m.d.
10x24" Hansen-Whitney Thread, m.d.
No. CT-36 and CT 54 Lees-Bradner Thread, m.d., latest
Carter & Hakes Mfg. Type, m.d.
24"x6' Ingersoll Slab, m.d.
30"x36"x12' Ingersoll Slab, m.d., 2 rail heads
36"x24"x8' Ingersoll, 1 rail, 2 side heads, m.d.
Burr Mfg., belted m.d.

UNIVERSAL MILLING MACHINES

No. 1 Cincinnati, cone, old
No. 4A Brown & Sharpe, m.d.
No. 4G LeBlond, m.d., with vertical slotting attach.

MANUFACTURING TYPE LATHES

No. 4 R. K. LeBlond Boring Lathe, 37' bed, 13" hole, m.d., latest
Model 8 Sundstrand Auto. Stub Lathe, m.d., latest
No. 9 H. D. LeBlond Multi-Cut Lathe, m.d.
3½x80", 3½x36", 8x84" LoSwing, m.d.
4x60" LoSwing, m.d., latest type
8x132" LoSwing, m.d., latest
9x12" Sundstrand Mfg., m.d.
11"x18" centers LeBlond Rapid Production, m.d.
13"x24" Coulter Automatic Threading, m.d.
13"x48" Coulter Automatic, m.d.
13"x96" Coulter Automatic, m.d.
15"x6' Coulter Automatic, m.d.
16"x6' Cincinnati Mfg., m.d.
16"x6' LeBlond Rapid Production, m.d.
17"x6' LeBlond Automobile Mfg., cone
17"x8' LeBlond Rapid Production, m.d.
20"x8' LeBlond Mfg. Type, m.d.
20"x16' American arranged for spindle boring
21"x8' LeBlond Turret, cone
21/40"x9' Pratt & Whitney Gap Plain Turning, cone
Niles-Bement-Pond Quartering Machine, new
Type NA 2B Schauer Machine Co. Speed Lathe, m.d.

PLAIN MILLING MACHINES

No. 000 Brown & Sharpe, m.d., latest
No. 0-8 Cincinnati Model EA Plain Automatic, m.d.
No. 1A Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1½, 2 Cincinnati, cone
No. 2B Brown & Sharpe, m.d. in base, dial type, latest
No. 2 Cincinnati H.S. Dial Type, m.d. in base, latest
No. 2L Cincinnati, m.d. in base, latest
No. 2HL Milwaukee, m.d. in base, latest
No. 3B Brown & Sharpe, m.d. in base, latest
No. 3S Cincinnati, m.d.
No. 3 LeBlond, cone
No. 3K Milwaukee, m.d. in base, latest
No. 3 Oesterlein, cone
No. 4 Cincinnati H.P., m.d.
No. 4B Brown & Sharpe, m.d.
No. 5B Heavy Brown & Sharpe, m.d.
No. 5 Cincinnati, rect. overarm, N.S.S., latest
No. 5 Cincinnati, rect. overarm, m.d.
No. 5 H.D. LeBlond, m.d.

VERTICAL MILLING MACHINES

No. 2, 3, 4 Cincinnati High Speed Dial Type, m.d., latest
No. 2, 3 Cincinnati Medium Speed Dial Type, m.d., latest
No. 2M Cincinnati, m.d. in base
No. 2, 3, 4 Cincinnati High Power, m.d.
No. 2H Milwaukee, m.d., latest, dial type
No. 2HL Milwaukee Swiveling Head, m.d., latest, dial type
No. 2K, 3K, 4K Milwaukee, m.d., latest, dial type
No. 2½, 3 Milwaukee, m.d.
No. 3V Toledo, s.p.d.
No. 3V Van Norman, m.d., latest
No. 4 H.P. Cincinnati, m.d., latest
No. 4H Milwaukee, m.d., dial type, latest
No. 4 Milwaukee, m.d. in base, fixed head
No. 5 Brown & Sharpe, cone
No. 5 Jackson, m.d.
No. 5 Reed-Prentice Miller and Die Sinker, m.d., latest
No. 6 Becker, cone
No. 28-60 Cincinnati 2 spindle Vertical Hydrotel, m.d., latest
Cincinnati Hydromatic Vertical, 2 spindles on rail

PLANERS

24"x24"x6' Gray, belt, 1 head
24"x24"x10' Whitcomb-Blaisdell, belted m.d., 2 heads
30"x30"x10' Gray, belt, 2 heads
30"x30"x14' Gray, belt, 2 heads
32"x32"x16' Gray, belt, 2 heads
36"x36"x10' Niles, belt, 2 heads
36"x36"x12' Cincinnati, 4 heads, reversing m.d.
36"x36"x18' Niles-Bement-Pond, 2 heads, reversing m.d.
36"x36"x20' Cincinnati, belt, 2 heads
36"x36"x20' Gray, belt, 2 heads
38"x38"x20' Gray, belt, 2 heads
42"x42"x26' Gray, 2 heads, m.d.
48"x48"x18' Detrick & Harvey, 4 heads, reversing m.d.
48"x48"x28' Cincinnati, 4 heads, reversing m.d.
48"x48"x30' Cincinnati, 4 heads, reversing m.d.
48"x48"x32' Niles-Bement-Pond, 4 heads, reversing m.d.
48"x48"x40' Sellers, 2 heads, reversing m.d.
56"x42"x10' Cincinnati, m.d., 4 heads
62"x62"x40' Cincinnati, 4 heads, reversing m.d.
66"x60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x24' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x36' Niles, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, belted m.d.
Coulter Type P10 Shaper Planer, m.d.
16'x12'x35' Niles, 4 heads, reversing m.d.

VERTICAL BORING MILLS

24" Bullard New Era, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head
36" Bullard Spiral Drive, m.d., with side head, high speed type, latest type
42" Bullard New Era, m.d., with side head
42" Bullard Spiral Drive, m.d., with side head
42" Colburn H.D., 2 swivel heads, m.d.
48" Cincinnati Rapid Production, m.d., 1 turret, 1 swivel head
48" Colburn, m.d., 1 turret, 1 swivel head
48" Putnam H.D., m.d., 2 swivel heads
54" Colburn H.D., m.d., 1 turret, 1 swivel head
84" Niles H.D., m.d., 2 swivel heads
100" Niles H.D., m.d., 2 swivel heads

BALL BEARING DRILLS

Allen Bench Type, m.d.
No. ½, 1, 2 Avey, belted m.d.
No. 1B Edlund, m.d., new
No. 2½ Allen, m.d., latest
No. 5M-16" Fosdick, m.d.
2 spindle No. 2 Avey MA6, m.d., latest
2 spindle No. 2 Avey, belted m.d.
2 spindle 21" Canedy-Otto, m.d.
3 spindle No. 2 Avey MA6, m.d., latest
3 spindle No. 3 Avey, belted m.d.
4 spindle No. 2 Avey, belted m.d.
4 spindle No. 2 Avey MA6, m.d., latest
4 spindle No. 2 Avey, belted m.d.

UPRIGHT DRILLS

21" Cincinnati-Bickford, m.d.
24" Cincinnati-Bickford Super-Service, box column, m.d., latest type
28" Cincinnati-Bickford, m.d.
30" Rich H.D., m.d.
32" Aurora, belt
40" Aurora, belted m.d.
H3 Barnes Hydram, m.d., latest
D4 Colburn H.D., m.d.
D8 Colburn H.D., s.p.d.
No. 25 Foote-Burt H.D., m.d.
No. 36HO Baker H.D., m.d.

THE ABOVE IS ONLY A PARTIAL LISTING. WRITE US YOUR NEEDS. LET US QUOTE.

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

MACHINE TOOLS

DRILLS

3'11" CANEDY-OTTO — RADIAL — 220/3/60/1800 — LATE TYPE — 1942 Mfg.
3'9" AVEY — Sensitive — RADIAL — Belt Drive.
21" CANEDY-OTTO — BG — Upright — #4MT — PF to spdle. — V-belt Drive — NEW.

GRINDERS

10"x24" LANDIS — Universal — Hyd. — 220/3/60 — Type C — 1944 Mfg. — Used 3 months.
12"x48" CINCINNATI — Universal — Hydraulic — 550/3/60 — LATE TYPE — 1942 Mfg.
#2 CINCINNATI — Centerless — "Filmatic" — 220/440/3/60 — Thru Feed work rest — infeed work rest and infeed attachment — LATE TYPE — 1943 Mfg.
#2 CINCINNATI — Tool & Cutter — 220/440/3/60 — Universal — Large assortment of accessories — LATE TYPE — 1941 Mfg.
9x20" DO-ALL — Hydraulic — Surface — with elec. chuck — LATE TYPE.
#2 BROWN & SHARPE — Surface — 6x18 — hand feed — MD — 220/440/3/60 — 1943 Mfg.
6"x18" MONARCH — Surface — Hand feed — XLO mtzd. Spdle—550/3/60 — with chuck.
10"x48" MAJESTIC — Cylindrical — 220/3/60 — mtzd. work head — mtzd. wheel head pump — piping — LATE TYPE — 1943 Mfg.
10"x24" NORTON — Cam Grinder — Mtzd.
#13 BROWN & SHARPE — Universal — Tool & Cutter — Wet. attachment — Cabinet — Lg. assort. of access. — LATE TYPE — 1942 Mfg.
6"x32" NORTON — Plain Cylindrical — MD — 220/440/3/60.

LATHES & TURRETS

16"x6' SEBASTIAN — Type R — 8 speed — Geared Head — Timken. Spdle. — NEW.
20"x54" REED-PRENTICE — 16 speed — Geared Head — Tauer Attach. — 220/440/3 — with additional equipment — LATE TYPE — 1942 Mfg.
14"x30" LODGE & SHIPLEY — 12 speed — motor in base — TA — chuck — stops — 4 way tool post — 220/440 — other equipment — 1941 Mfg.
14½"x6' SOUTH BEND — chucks — motor in base — LATE TYPE — 1943 Mfg.
14"x6' HENDEY — Geared head — factory MD — chucks — less mtr.
16"x6' HENDEY — QCG — Taper attachment — Chuck — Collets — MD.
#5 JONES & LAMSON — Universal Turret — LATE TYPE — 1943 Mfg.
#3 JONES & LAMSON — Universal Turret — 220/3/60 — with bar feed and chucking — LATE TYPE — 1943 Mfg.
#2 WARNER & SWASEY — PF to turret — Cross slide — BD — arr. MD.
#200 LOGAN — Floor — with Turret attach. — Cross slide — Quick acting collet attach. — LATE TYPE — 1946 Mfg.

MILLING MACHINES

#3K K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1943 Mfg.
#3H K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1942 Mfg.
#2K K&T "Milwaukee" Plain Horizontal — Power rapid traverse — 220/440/3/60 — motor in base — LATE TYPE — 1943 Mfg.
#3 CINCINNATI — Dial Type — Plain Horizontal — Power rapid traverse — 220/3/60 — LATE TYPE 1942 Mfg.
#2I GARVIN — Plain Horizontal — Belt drive.
#1 ROCKFORD — Plain Horizontal — Drive — All MD— 3 Tee slot.
1 GARVIN — Hand — Lever feed table — Belt drive — Stationary spdle.
#34 OHIO — "Osterloin" — Universal — Belt drive — New dividing heads.
#2—24 CINCINNATI — Rise and fall — LATE TYPE — 1942 Mfg.
#3H K&T "Milwaukee" — VERTICAL — Power rapid traverse — Power feed to head — Motor in base — LATE TYPE — 1942 Mfg.
#2H K&T "Milwaukee" — VERTICAL — Power rapid traverse — Power feed to head — Motor in base — LATE TYPE — 1942 Mfg.
#5 BECKER — Vertical — Belt drive — Motor bracket — 12x48" table.
#2 BROWN & SHARPE — Plain Horizontal — Light Type — 200/440/3/60 — LATE TYPE.
#2 K&T "Milwaukee" Plain Horizontal — Dbl. Overarm.

PRESSES

DP53 FERRACUTE — 40 ton — SS — Motor driven — 220/3/60 — Plain — With side shear — 1940 Mfg.
#3K PERKINS — Screw — NEW.

SAWS

#4C COCHRAN-BLY — Cold — Inserted tooth blade — MD — 220/3/60.

SCREW MACHINES

#0G BROWN & SHARPE — Fully automatic — Vertical slide attachment — Serial No. 7500.
#00G BROWN & SHARPE — Fully automatic — Serial No. over 17,000 — Motor driven slotting attachment — LATE TYPE — 1943 Mfg.
#00G BROWN & SHARPE — Fully automatic — Serial No. over 14,000 — Motor driven slotting attachment — Swing stop — Other equipment — LATE TYPE.
#00G BROWN & SHARPE — Fully automatic — Serial No. over 11,000 — Motor driven slotting attachment — Swing stop and equipment — LATE TYPE.
#R4 NATIONAL ACME — 4 spdle — Fully automatic — 3½" cap. — 220/440/3/60 — complete assortment of equipment — LATE TYPE.
#0 BROWN & SHARPE — Fully automatic — Belt drive.
#R NATIONAL ACME — 4 spdle — Fully automatic — 1⅜" cap. — LATE TYPE — Extra equipment.
2" GREENLEE — 6 spdle — Fully automatic — Motor driven — LATE TYPE — 1942 Mfg.

SHAPERS

16" GEMCO — "Lubrigard" — 220/3/60 — Power rapid traverse — Heavy duty — NEW.
28" AMERICAN — Back geared — Power feed to head — Single pulley drive.
24" GOULD & EBERHARDT — Crank — Motorized with 4 speed drive.
7" LOGAN — Floor type — 110/1/60 — NEW.

SHEARS

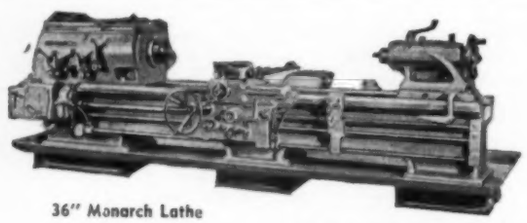
36" PEXTO — Power squaring — Motor drive — 16 gauge.
42" WHITNEY — Power squaring motor drive — 220/3/60 — 16 gauge — NEW.

MISCELLANEOUS

PLANER — Woodward & Powell — 50"x60"x12' — 2 rail heads — 1 side head — Box bed.
PLANER — Woodward & Powell — 48"x48"x14' — MD
PLANER — Woodward & Powell — 30"x30"x12' — 2 rail heads — 2 side heads — Down feed and elevation — Box bed — BD.
PLANER — Whitcomb — 24"x24"x6' — Arr. for motor drive — Less elec. equip. — 1 rail head.
PUNCH & SHEAR — Williams & White — 3" cap. — Wt. approx. 30,000#.
CLUTCH CUTTERS — Waltham.
PROFILER — Pratt & Whitney — #13 — Gear driven.
SUPERFINISHER — Foster.
GEAR CUTTER — Brown & Sharpe — #6 — 72" spur.

UNITED MACHINERY & TOOL CORPORATION

34 HERMAN STREET — **WORCESTER 8, MASS.**



36" Monarch Lathe

Tremendous Stock of Machine Tools Photograph and Catalog on request

S & S MACHINERY CO.

140-53RD STREET — **BROOKLYN 32, N. Y.**

WOrth 4-5140

HEADLINERS

LATHES

20"x8' L&S Grd. Hd., AC mtr. in leg
20"x8' HENDEY Grd. Hd., AC mtr. in leg
24"x14' L&S Turner Uni-Drive
36"x20' L&S Selec. Grd. Hd., AC MD

MILLERS

#2M CINCINNATI Plain, AC MIB
#3B B&S Plain, DOA, PRT, AC MIB
#4B B&S Plain, DOA, PRT, AC MIB
#14 COCHRANE-BLY Univ. Vert. & Shaper, AC MD
#4B MILWAUKEE Plain, arr. MD, DOA, PRT

SHAPERS

24" & 32" G&E H.D. Invincible Shapers, AC MD
24"x24"x6' CINCINNATI Planer, AC MD
42"x42"x10' LIBERTY Openside Planer, AC MD

GRINDERS

#72A2 HEALD "Sizematic" Internal, AC MD
#2 BROWN & SHARPE Univ., arr. AC MD
#22 HEALD Rotary, AC MD
#51 OLIVER Drill, AC MD
16"x72" LANDIS Plain, Self-Cont.

MISCELLANEOUS

24"x36" BULLARD "New Era" VTL's, AC MD
#12 BARBER-COLMAN Gear Hobbers
6' CINCINNATI-BICKFORD Radial Drill, Mtr. on arm
7' DRESES Radial Drill, gearbox, AC MD
#3A W&S Univ., AC MD, covered ways
10" P&W Vert. Shaper
12'x10 ga. OHL Press Brake
#34 B&S Gear Hobber, AC MD
#8-DT POTTER & JOHNSTON Auto. Chucking & Turning Machine

COX MACHINERY CO.

P. O. Box 1953 — **Cincinnati 1, Ohio**

Office & Warehouse: 311-313 Bakewell St., Covington, Ky. 3 minutes from the Cincinnati hotel district

---

AVAILABLE

NEW 1945

LANGELIER MODEL L-11 SWAGING MACHINE, 6½" Cap. 14 head rolls, 4¼" dia. head rolls, Fixed Ring Type, Hydraulic Feed Mechanism, Motor Driven with 50 HP & 15 HP. COST NEW over $26,000.

NEW 1945

LANDIS 6 x 18 PLAIN HYDRAULIC GRINDER with extra LIVE SPINDLE HEADSTOCK. May be inspected under power in mfr's plant.

AT BARGAIN PRICE

WRITE — WIRE — PHONE

HASCO MACHINERY COMPANY

661 FRELINGHUYSEN AVENUE
NEWARK 5, NEW JERSEY
Bigelow 3-3486-7-8

McDONALD

USED MACHINERY

G & E 24" Cin. 32" Shapers
Cleveland O.S. Planer 36"x8', 2 hds.
Abrasive #34 M.D. Vert. Surf. Grinder
Cincinnati D. H. Planer 36"x36"x10', 2 hds.
Monarch 20" grd. hd., M.D. Lathe 16 sp. Speeds Model "M"
Bullard Vert. Turret Lathes, 24" & 36" S. Head
Defiance 3" Horiz. Boring Mill & Univ. #3-A
L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 28"x12' Lathes Monarch Model "C"
American 24'x12 grd. hd. lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Colburn 60" & 72" Vert. Boring Mills.
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cin-Bick 3' Super Serv. Radial
Gisholt 3R Grd. Hd. M.D. Turret Lathe
W.&S. No. 2A grd. hd. Univ. Turret Lathe, S.P.D.
Foster No. 2F Fostermatic grd. hd. Turret Lathe, M.D.

MDNA MEMBER

McDONALD MACHINERY CO.

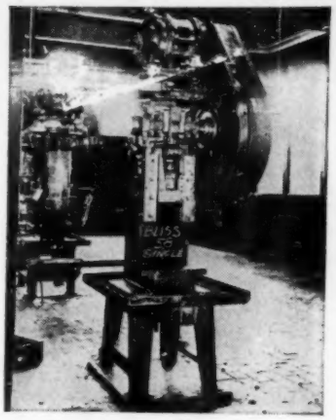
1531-35 N. B'way, St. Louis 6, Mo.

No. 0G B & S high speed Automatic
No. 4 High Speed Hammer
No. 3 Abrasive Surface Grinder

MDNA MEMBER

D. E. DONY MACHINERY CO.

47 Laurelton Road, Rochester 9, N. Y.



BLISS No. 58

FOR QUICK SALE—FROM STOCK

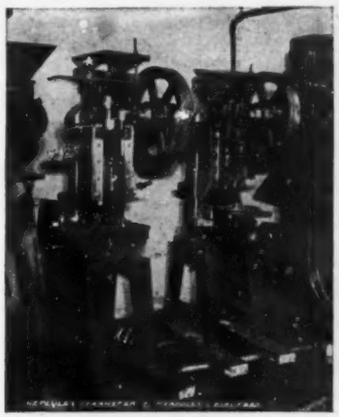
SPOT DELIVERY

Brakes—New Lynn 56″ x 14 G Hydraulic Press, Motor ($1650.00)
D & K 8′ x 16 G Apron, Motor ($575.00)
D & K (Press) 12½′ x ⅜″

Shears—Pexto 5′ x 16 G ($475.00)
Geo. Ohl 8′ x 12 G, Motor
Morgan 10′ x 1½″ cap. (25% of cost)

Saw—Doall contour 16″

Spot Welders—Sterling (New) 10, 15, 20 & 30 KVA



HERCULES
1 TRANSFER—1 DIAL FEED

Ironworker Pels #24 Punch, Shear, Coper. 6″ x 6″ x ¾″ cap.

New Press Brake —10′ x ⅜″—all steel—30-60 days delivery.

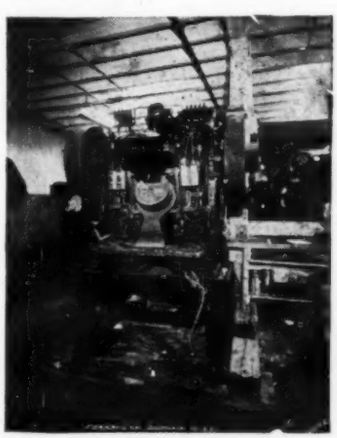
New Square Shear—10′ x ⅜″—all steel—30-60 days delivery.

Rolls, Bending, 20′ x 1″ cap. Initial type, Drop End

POWER PRESSES

MAKE	TONS	STROKE	DIE SPACE	TYPE
Bliss #19	17	1″	9½″ x 17½″	OBI (Bargain—$375)
(12) Hercules (1942)	22	3″	10″ x 14½″	Dial and Hopper ($400 each)
(7) Hercules (1942)	22	6″ 3″ Ram	10″ x 14½″	Feed Transfer ($400 each)
(10) Wat-Farrel (1942)	25	3″ Table up	12″ x 21½″	Double or Single Action, Dial Feed ($500 each.
(4) Bliss #58 (1943)	20	5″	12¼″ x 13½″	3 HP Motor 3/60/220 & 1/15 HP Motor
(4) Ferracute C22 Duplex 2 Presses on 1 stand (1943)	20	5½″	13½″ x 14″	Pinwheel Feeder & Hopper, Two 3 HP Motors, 3/60/220-440 plus Two ¼ HP Motors
(2) Bliss #62A (1943)	30	8″	14″ x 24″	Pinwheel Feeder & Hopper, 3 HP Motor) 3/60/220-440 plus 1/15 HP Motor
Federal #3 (1943)	30	8″	14″ x 24″	Pinwheel Feeder & Hopper, 3 HP Motor, 3/60/220-440 plus 1/15 HP Motor
Torrington	50	2″ & 1″	23″ x 16″	Sub Arch Press, Double Action Cam
Bliss #4 Header (1943)	56	8″ & 6″	1½″ x 2⅜″	Horiz. Double Header, Single Die
Toledo #54	60	3″	18″ x 18″	SS with side shear
Bethlehem	88	2½″	62″ x 58″	SS Double Crank, Single Action
Bliss #5	90	5″	22″ x 30″	SS Single Action
Bliss #6	125	5″ & 2″	24″ x 32″	SS, Dble or Single Action, b.g.
Bliss #7	180	5″ & 2″	28″ x 36″	SS, Dble or Single Action, any Stroke up to 5″, b.g.
Clearing (F1200-42)	200	Any stroke up to 26″	36″ x 42″	Steel, SS
(2) Bliss #77½	250	12″ & 14″	30″ x 29″	SS Single Action, b.g.
(4) Bliss #78½	450	16″	36″ x 36″	SS Single Action, b.g.
Toledo #60¼	1200	23½″	59″ x 50″	SS Single Action, b. g.
Birdsboro Hyd	1300	21″	87″ x 29″	SS Hydraulic

(Subject to Prior Sale)



FERRACUTE
DUPLEX No. C22

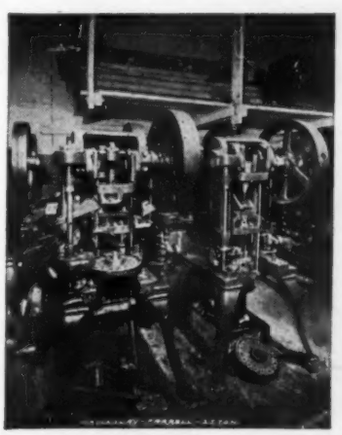
KINGS COUNTY MACHINERY EXCHANGE

408 ATLANTIC AVENUE

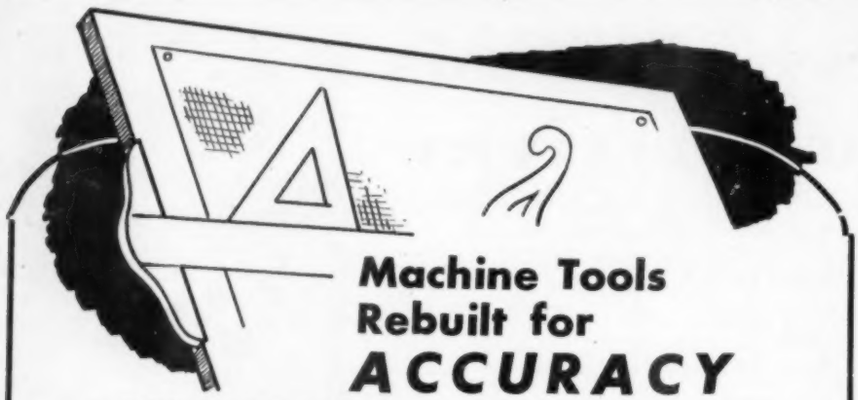
BROOKLYN 2, N. Y.

Wire - Write - Phone

TRIANGLE 5-5237 - 5212 - 5213



WATERBURY-FARREL
25 TON



Machine Tools Rebuilt for ACCURACY

A WIDE SELECTION AT LESS COST TO YOU

LATHES

Bradford 12"x6' Lathe, New, 12 speed, timk. bear., grd. bed., motor in base, latest type.

L. & S. 27½"x16' Eng. Lathe, sw. over ways 28", sw. over carr. 19½", dist. betw. cens. 10', diam. of tailstock 3½", dbl. bk. grd., motor driven.

BORING MILLS

1—Yoder #3A Hor. Bor. Mill, diam. of bar 3", Morse Taper #5, dist. to outer support 72", bar trav. 24", latest type, motor driven.

Lucas #31 Hor. Bor. Mill; diam. of spin. 3", 60" from outer support, top of tbl. to cen. of spin. 24", size of tbl. 24"x48".

Bullard 100" motor driven, rap. prod. Vert. Bor. Mill, cap. 102" in diam. 84" in hght., tbl. diam. 92", wght. approx. 80,000 lbs.

PLANERS

1—Putnam 84"x84"x40' Dbl. Hous. Planer, Revers., M.D. and controls, 2 heds. on cross rail, 2 side heds., just taken out of service.

1—Woodward-Powell 48"x48"x14', 2 heds. on cr. rail, 2 side heds., reversible M.D., motor control complete, generator set.

Chandler 36"x36"x10' Planer, 2 heds. on cross rail, motor driven, heavy duty.

TURRET LATHES

2—W. & S. #5 Univ. Turret Lathes, very latest type, sw. over bed 20", capac. 2½", (1) arr. for for bar, (1) arr. for chuck.

2—Gisholt #3L, hole thru. spin., Turret Lathe, 5¼", bar and chuck equip. very latest type.

MILLING MACHINES

2—B. & S. #2A Univ. Mill. Machines; tbl. wkg. surf. 45"x11⅛"; feeds-long. 28", cross 10", vert. 18".

1—Milwaukee No. 3B Univ. Miller, tbl. wkg. surf. 55"x15", 3 jaw Univ. chuck, feeds-long. 26", cross 12", vert. 20", spin. speeds 18, range 13-320 RPM, AC motor driven.

B. & S. #3A Univ. Mil. Machine, motor in base, tbl. overall 57½"x13¼", feeds long. 34", cross 12", vert. 19".

2—Cin. #3 Vert. Dial Type Miller, latest type, tbl. wkg. surf. 62½"x15¼", long. feed 34", cross 16", vert. 16", spindle speeds 18-450 RPM.

Cin. #4 Pl. Hi-Power Miller, rect. overarm, No. 50 Taper, timk. bearings, tbl. wkg. surf. 68"x19", feeds long. 42", cross 14", vert. 20", wght. 9700 lbs.

PRESSES

Ferracute PG 4 Press, 50 ton capac. wght. 5800 lbs., flywheel speed 300 RPM, stroke of ram 1½", adj. of ram 3", throat from cen. of ram back to frame 8½", hght. of bed to ram, top of stroke and adj. 10".

Billings & Spencer #2 Trimming Press, complete cut-off slide, stroke 4", daylight 18½", dist. betw. uprights 26".

GRINDERS

1—Hill-Acme Hydraulic Surf. Grinder, capac. 18"x 24"x96", horiz. spin., with mag. chucks, latest type.

Norton #2 Univ. Tool & Cutter Grinder, motor driven, late type, capac. 12"x28", long. tbl. trav. 24", cross 8".

LeBlond #2 Univ. Tool & Cutter Grinder, late type, motor driven, capac. 10"x24", tbl. long. trav. 24", cross 8".

Blanchard #11 Surf. Grinders, very latest type, chuck 16" diam., wheel 11", depth 5", 15 HP, motor driven, dual voltage.

MISCELLANEOUS

Nat. Mach,. Co. 3", 4", 5" and 7½" Upsetters; 2" and 6" Ajax Upsetters.

Stockbridge 24, motor driven, Crank Shaper, single pulley drive; stroke 24¾", vert. trav. of tbl. 15", hor. tbl. trav. 30".

Complete Your Machine Tool File. Send for our Catalog. Write, wire or phone WOrcester 6-5175

Botwinik Brothers of Mass., Inc.

MAN ST. WORCESTER 8, MASS.

National Bent Shank Nut Tappers—Battery of ⅝" and ⅞" Machines.

2 Landis ¾" Bolt Formers and Threaders, M.D.

1 National ½" to 1" Hot Bolt Head Trimmer

Woodward & Powell 42"x42"x36 ft. 4 Head Planer

Cincinnati 36"x36"x16 ft. Planer, M.D.

1 Lodge & Shipley 36" Swing by 44 ft. Bed, Selective Geared Q.C. Lathe, M.D.

National Machinery Exchange

128-138 Mott St., New York 13, N. Y.

B4B NATCO 48-spdl. Holesteel Drill

3'-11" American Hole Wizard Radial

#12 Landis Centerless Grinder

16"x24"x72" Mattison Surface Grinder

6"x18" Norton "C" Hydraulic Grinder

6"x30" Norton "C" Hydraulic Grinder

#1248 Kearney & Trecker SIMPLEX Miller

#3HS Cincinnati Vertical Miller

#2—#3—#4—#5 Warner & Swasey Universal Turret Lathes

#1 Brown & Sharpe Wire Feed Hand Screw Machines

ALL LATEST TYPE MACHINES

HAZARD BROWNELL

350 Waterman St., Providence 6, R.I.

MILES' QUALITY

Automatic, 2⅝" Acme Gridley RA6
Automatic, 12"x63", 14"x19" & 16"x33" Fay
Broach, Twin 10 & 3XA Oilgear
Broach, 2S, 3H LaPointe
Drill, 3'9" & 4'9" Cint. Bick. radial
Drill, 21" & 24" Cint. Bick. upright
Drill, Nos. 11, 14 & 30 Natco multiple
Drill, Nos. 121, 217, 314, 315, 321 Baker
Drill, 24", No. 3 Aveymatic 2 spindle
Gear Hobber, Nos. 3, 12 & Type D Barber Colman
Gear Hobber, Nos. 16HS, 12H & 8H G. & E.
Gear Hobber, No. 5M Adams Mfg.
Gear Hobber, No. 130 Cleveland
Gear Hobber, Nos. 1 & 5AC Lees-Bradner
Gear Shaper, Nos. 7 & 61 Fellows
Grinder, Centerless, Nos. 2 & 3 Cincinnati
Grinder, 6"x18" No. 10 Brown & Sharpe
Grinder, 10"x18" & 10"x96" Cincinnati
Grinder, 6"x18", 10"x18" & 16"x36" Landis
Grinder, 6"x18" & 10"x72" Norton
Grinder, 12"x36", No. 2 B. & S. univ.
Grinder, No. 115 Gardner opposed disc
Grinder, Disc, No. 226 Gardner
Grinder, Surface, 10"x24" Norton hydraulic
Grinder, Surface, 12"x48" Thompson hydraulic
Grinder, Surface, 14"x60" Mattison hydraulic
Grinder, Surface, 12", 16" & 24" Heald rotary
Grinder, Surface, Nos. 10 & 16 Blanchard rotary
Lathe, 14"x8' Hendey toolroom
Lathe, 22"x96" Monarch
Lathe, 25"x48" LeBlond
Lathe, 36"x16' bed Bridgeford
Lathe, Turret, Nos. 2, 3, 4, 5 & 1A & 3A Warner & Swasey
Lathe, Turret, No. 3, 4, 5 & 1L Gisholt
Lathe, Turret, No. 2 Cint. Acme saddle type
Lathe, Turret, No. 601 Oster
Lathe, Turret, No. 5 Foster
Lathe, Turret, No. 5 Bardons & Oliver
Lathe, Turret, Nos. 2G & 3 Morey
Lathe, Turret, 24", 36" & 42" Bullard vertical
Lathe, Mfg., 14"x18" Monarch Magnamatic
Lathe, Mfg., 6", 8", & 15" Sundstrand auto. stub
Lathe, Mfg., Mod. 10x40" Sundstrand center drive
Mill, 3⅛", No. 0 Giddings & Lewis
Mill, 3½" bar Universal
Mill, 4¾" bar Giddings & Lewis floor type
Mill, 7" Barrett cylinder boring
Mill, Vertical, 53" & 100" Niles-Bement-Pond
Mill, Vertical, 96" Cincinnati
Millers, Nos. 2AS, 3B & 4B Milwaukee plain
Miller, No. 3 Cincinnati universal
Miller, No. 3 Van Norman duplex
Miller, Nos. 3 & 4 Cincinnati dial type
Miller, Nos. 2M, 2, 3, 4 & 4HD Cincinnati vertical
Miller, No. 2H, 3H & 4H Kearney & Trecker vertical
Miller, Nos. 2-24, 3-24, 4-36, 4-48, 5-48, Cincinnati Hydromatic
Miller, No. 33 Sundstrand, 18"x120" table planer type
Miller, No. 12-24" Brown & Sharpe Mfg.
Miller, 30" & 66" Newton rotary
Miller, 30", 42" & 84" Ingersoll rotary
Miller, Nos. 4 & CT36 Lees-Bradner thread
Miller, No. 3 Planomill thread
Planer, 33"x33"x8' Cincinnati
Planer, 48"x48"x12' Cincinnati
Press, Nos. 10, 73½ & 304 Bliss S.S.
Press, Nos. 56 & 56½ Toledo S.S.
Press, 70 ton Verson, cushion
Press, 1000 ton No. 666 Toledo coining
Press, 100 & 200 ton Hydraulic
Roll, No. 18 Kane & Roach straightening
Saw, No. 302 Campbell abrasive
Saw, 42" Tannewitz metal band
Shaper, 6" Pratt & Whitney vert.
Shaper, 12" Whipp
Shaper, 16", 20" & 28" Gould & Eberhardt
Shaper, 20" & 24" Gemco universal
Shaper, 36" Rockford shaper planer
Tapper, No. 1 Bakewell
Tapper, Nos. 2 & 2X Garvin
Upsetter, 1" National High Duty
Upsetter, 1½" Acme

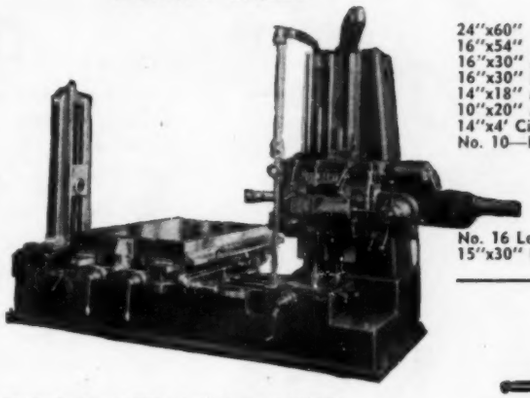
SEND FOR STOCK LIST

MILES MACHINERY CO.
SAGINAW, MICH.

JUST · · · GOOD · · · TOOLS

that keeps OLD FRIENDS and makes NEW ONES

BORING MILLS

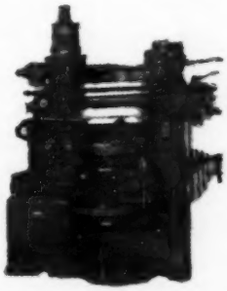


3½" Cincinnati Gilbert, Horizontal (1942)
3" Universal—Horizontal
60" Niles, Bement, Pond, vertical

MILLS

No. 9J Gorton Vert. with duplicator Table (1942)
No. 3V Reed Prentice Vertical Mill
No. 6 Becker Vertical Mill
No. 4 Cincinnati Vertical Mill (1942)
No. 4H Kearney & Trecker Vert. Mill (1943)
No. 3H Kearney & Trecker Vert. Mill (1943)
No. 3 Cincinnati Vert. Mill (1942)
No. 2 Cincinnati Vert. Mill (1942)
No. 2K Kearney & Trecker Vert. Mill (1943)
No. 2H Kearney & Trecker Vert. Mill (1944)
No. 4B Kearney & Trecker Plain Mill
No. 2 Cincinnati Universal Mill (1941)
No. 4 Cincinnati Plain Mill (1941)
No. 3 Cincinnati Plain Mill (1941)
No. 3SP Van Norman Plain Mill (1942)
No. 2L Cincinnati Plain Mill

GEAR MACHINES

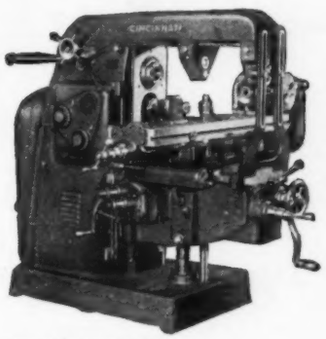


No. 615A Fellows Gear Shaper (1941)
No. 12 Barber Colman Gear Hobbers
No. 3 Barber Colman Gear Hobber
7½"x11" Hanson-Whitney Thread Mill

LATHES

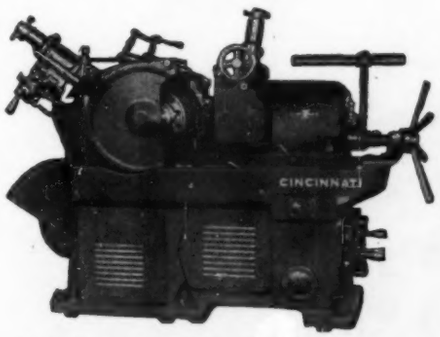
24"x60" Springfield Tool Room Lathe (1941)
16"x54" Rockford Tool Room Lathe (Timken)
16"x30" Monarch "CW" Toolroom, 1943
16"x30" Hendey Engine Lathe
14"x18" Monarch Magnamatic Lath.
10"x20" Monarch Precision T. R. Lathe (1939)
14"x4' Cisco Production Lathe
No. 10—No. 12 Sundstrand Automatics (1942)
Model "U" LoSwing (14"x12") Automatic (1942)
No. 5 DELX Potter & Johnston Automatic (1943)
No. 6A Potter & Johnston Automatic
No. 16 LeBlond Heavy Duty Automatic (1944)
15"x30" Lipe Carbomatics (1942)

MILLS



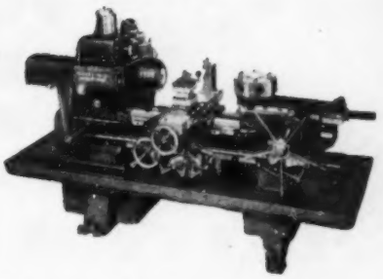
No. 1 Superior Hand Mill
48" Oesterlein Tilted Offset Mill
30"x24"x8' Ingersoll Planer Type Mill

GRINDERS



No. 2 Cincinnati Centerless (Filmatic) (1942)
No. 3 Cincinnati Centerless (Filmatic)
No. 13 Brown & Sharpe Universal (1941)
48"x16"x12" Diamond Hyd. Surface Grinder
6"x18" Norton Cylindrical Semi-Automatic, 1943
12"x36" Norton Cylindrical, Universal, 1943
No. 16 Blanchard Rotary Surface Grinder
No. 3D Gardner DE Polishers—5 H.P. (1942)

TURRET LATHES



No. 5 Warner & Swasey Turret Lathe (1941)
No. 6 Warner & Swasey Turret Lathe
No. 3 Warner & Swasey Turret Lathe (1942)
No. 7A Jones & Lamson Turret Lathe Bar Feed

DRILLS

3'-11" American "Hole Wizard" Radials (1941)
3'-11" Carlton Radial Drills (1941)
No. 3—36" Defiance Heavy Duty Drill
No. 3—24" Defiance Heavy Duty Drill
No. 2—24" Defiance Heavy Duty Drill
No. 2LMS Leland Gifford, hydraulic (1942)
No. 2LMS Leland Gifford 2 spindle, Hyd. (1942)
No. 30 Natco Multiple Spindle Drill
No. 14 Natco Multiple Spindle Drill

SCREW MACHINES

No. 60 New Britain 1" 6 spindle (1943)
1" Greenlee Automatic 6 spindle (1943)
2G Brown & Sharpe, 1939

NEW MACHINES

Bradford Buffers, Grinders & Electric Drills
Kalamazoo Metal Band Saws
Leach Surface Grinders
Rockford Presses
Wysong & Miles, shears and rolls

MISCELLANEOUS

12" Pratt & Whitney Vertical Shapers (1941)
No. 29U Williams & White Bulldozer (1941)
Type J Bullard Mult-au-Matic, Ser. No. 15037
500 amp. Lincoln Arc Welder

A GOOD HOUSE TO DEAL WITH

MACHINE TOOLS

DONBERG D&D DANITS

400 SOUTH CLINTON STREET • CHICAGO 7, ILL.

QUALITY *Machine Tools* NOW IN STOCK

28″ x 60″ Cincinnati Hydrotel Vertical Milling Machine, single spindle model with 360° profiling attachment, motors and controls. New in 1941.

AUTOMATICS

9/16″ RA-6 Acme-Gridley. New in 1943.
1″ RA-6 Acme-Gridley. New in 1943.
1¼″ R-6 Acme Gridley.
1⅝″—8 spindle Conomatic. New in 1942.
5¼″ Cleveland Model A, single spindle.
16″ x 33″ Fay Automatic Lathe. New '41.
★ **Bullard Multaumatic, six spindle model D, single index. Late model.**

BROACHES

No. 28L LaPointe Hydraulic Horiz. 1942.
No. CPC 8-24 LaPointe Hyd. vert. 1943.
No. CPC 6-36 LaPointe Hyd. vert. 1943.

DRILLS

6 Ft. American radial 17″ column.
4′-9″ Cincinnati-Bickford Radial. New in 1945.
★ **No. 26HO Baker Hydraulic, S. S., 3″ capacity in steel, with motor & control.**
42″ Cincinnati-Bickford, single spindle.
No. 3 Avey, three spindle, heavy duty.
No. 3 Baush Multiple Spindle.
Barnes Horiz. Deep Hole, two spindle.
Taft Peirce Horizontal, double end.

GEAR CUTTERS

No. 16H Gould & Eberhardt Universal Hobber. Latest type.
No. 7A, 7125A Fellows Gear Shapers.
No. 615A, 645A, Fellows Gear Shapers.
No. 3, 12 Barber Colman Hobbers.

GRINDERS

No. 2 & No. 3 Cincinnati Centerless, Filmatic spindle. New in 1941.
14″ x 48″ Cinci. Plain, Filmatic spindle.
10″ x 36″ Landis Hydraulic. New '43.
6″ x 18″ Cinci. Hyd., Filmatic spndl. 1943.
No. 3 Brown & Sharpe Universal. 1943.
No. 13 Brown & Sharpe Univ. and Tool.
No. 2 Norton Universal Tool.
No. 18 Blanchard, 30″ chuck. New 1942.
14″ x 16″ x 60″ Mattison Surface.
No. 75A Heald Internal. New in 1943.
No. 72-A-3 Heald Sizematic. New in 1943.
No. 16-16 Bryant Internal, Hydraulic. Used less than 2 years.

LATHES, ENGINE

Monarch Toolmakers 10″ x 20″ Model EE.
Lodge & Shipley 20″ x 48″. New in 1943.
★ **Bertram 28″ x 240″ "Timesaver", two carriages, rapid traverse. Canadian made from Niles patterns. New in 1942.**
Lodge & Shipley 48″ x 54″, cone driven.
Carroll Jamieson 18″ x 5′, C.D.
LO-Swing, IMP & LR.
South Bend 14½″ x 6′, c.d.
Lipe Carbomatic, 15″ x 30″.
LeBlonde Production, 17″ x 30″.

LATHES, TURRET

Warner & Swasey No. 2A, preselector. New in 1943.
Warner & Swasey No. 1A, preselector. New in 1940.
Gisholt No. 1L, Hyd. speed selector. 1943.
Warner & Swasey No. 5 Universal. 1943.
Gisholt No. 5 Universal, Hydraulic speed selector. New in 1944.
Foster No. 5 Universal, Bar feed. 1943.
Warner & Swasey No. 4 Universal, preselector. New in 1943.
Gisholt No. 4 Universal, Hydraulic speed selector.
Warner & Swasey No. 3 Universal, two speed. New in 1942.
Bardons & Oliver No. 3 Universal, motor in base. New in 1941.
Warner & Swasey No. 2, oversize. 1942.
Bardons & Oliver No. 2, bar feed. 1941.
Brown & Sharpe No. 1, m. in base, 1941.
★ **Bullard New Era VTL, 36″ x 42″.**

MILLS

Van Norman No. 28U Universal.
Gorton No. DJ Vertical, with tracer.
Cincinnati No. 2MH Plain, latest model.
Cincinnati Vertical, No. 3, Med. S. Dial.
Milwaukee Vertical, No. 2H. New in 1942.
★ **72 Betts Vertical Boring Mill, two heads, DC driver with AC/DC generator. New in 1943.**

MISCELLANEOUS

No. 5B Standard OBI Press. New.
No. 7 Kling Punch, 1¼″ through 1″, 72″ throat.
No. 8-6 Zeh & Hahneman S.S. Geared Press.
Pratt & Whitney Profiler, No. 12D.
25″ Gleason Quenching Press.
24″ Cincinnati Worm Feed Rotary Table.

PLANERS AND SHAPERS

Cincinnati Planer, 42 x 42 x 20, D.C.
Cincinnati 24″ Shaper, Univ. table. 1945.
American 24″ Shaper.
Gould & Eberhardt 24″ Shaper.
Cochrane & Bly No. 14 Vertical Shaper.
Pratt & Whitney 6″ Vertical Shaper.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1961 S. Meridian St., Indianapolit 6, Indiana
EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: HIDALGO ORIENTE 2-325-B, MEXICO, D.F.

GOVERNMENT SURPLUS

NEW Pedestal Grinder and Buffer

$97.00

FOB New Orleans

Complete with Grinding Wheels, Wire Buffer & Glass Guard.

NEW, Never used equipment. All in original wood packing case. Manufactured by Cincinnati Elec. Tool Co. — Type KHA-Y. 220 V, 3 PH, 60 Cycle. Ball Bearing, 1″ grinding wheel, ½″ bore.

Write or Wire

BYRNE & RICE SUPPLY CO.
344 S. Diamond New Orleans, La.

FOR SALE

Columbia all steel gap shears (new). 12′x3/16″x18″ gap. 10′x3/16″x18″ gap. 6′x¼″x18″ gap.

Columbia all steel power press brakes (new) 10′x 3/16″, 8′x¼″, 6′x¼″.

Double Crank Presses (new) straight side tie rod construction 100, 150, 200, 250, 300 tons.

O.B.I. Presses (new) 6 to 90 tons. Flywheel, geared.

(4) Bliss #78½ 350 tons 18″ stroke, 44″ shut height, bed 36″x36″, Bolster 24″ thick. Pneumatic cushion in bed. Friction clutch, air operated, motorized.

(3) Bliss #304 55 tons—9″ stroke, adj. 2½″, shut height 12″, bed area 17″x17″. Bed accommodates Pneu. cushions, motorized.

(4) Bliss #6 Triple Crank Drawing presses. Strokes. Blank Holder 2 inches, drawing slide 5″ adjustments blank holder slide 1″, Drawing slide 2″ shut heights. Blank holder 13 inches, drawing slide 16″. Blank Holder (cutting slide) 80 tons, drawing slide 55 tons, Bolster area 24″x31″. Roll feed and scrap cutting attachments, motorized.

EDW. FRANKLIN SCHILL CORP.
39 Cortlandt St., N. Y. 7 WO 2-2473—2-0232

Bor. Mill Hor. 3″ G & L. M.D.
Boring Mills, 24″-36″-42″-52″-72″-96″
Drills, Radial 3′-4′-5′-6′ Cin.-Bick.
Lathe, Turret 3-A W. & S., S.P.D.
Millers, Plain No. 3 K & T, No. 4 Cin.
Millers, Vertical No. 3 B & S & No. 4 Cin.
Profiler, #13 P. & W., B.D.
Shapers, 16″-20″-24″-36″.
Shaper, 36″ Morton Draw Cut.

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

POWER PRESSES

BLISS, TOLEDO, V & O ETC.
REBUILT — GUARANTEED
MONA MEMPHIS

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

GRINDING WHEELS 3″ to 36″ Diameter

31,000 wheels, new and packed in original factory containers. For grinding steel. National known manufacturers. Guaranteed perfect. Interested in disposing of entire lot. *Write for catalog.*

UTILITY INDUSTRIES CO.
34 BURNSIDE AVE. EAST HARTFORD, CONN.

POWER PRESS BRAKES

Cincinnati 375 ton, 8′8″ overall, 6′6″ bet housings, ⅜″ cap. New 1942.

Clearing #90-10, 12′ overall, 10′ bet. housings, 10 ga. New 1942.

Pratt & Whitney #2A Jig Borer #3644 with equipt. New 1945—Barely used.

AARON MACHINERY CO., INC.
45 CROSBY STREET, N. Y. C.
Tel. Digby 9-1766

GRINDERS—READY FOR DELIVERY!

Special Price $160.00 Each

185 JARVIS FLEXIBLE SHAFT GRINDERS

available for immediate delivery. Each equipped with 2 H.P. General Electric, explosion proof motors, Class 2, Group G. 220/440 volt, 60 cycle, 3 phase, 3600 rpm. with underwriters label attached, with push button starter with overload protection, with 7 foot flexible shaft with right angle grinding head. These units are like new, however, they will be sold GUARANTEED REBUILT.

Units originally designed for propeller sanding and polishing, however, they are good for buffing chrome plate, polishing automobile bodies, sanding speed-boat hulls and many other tough grinding, polishing, sanding and buffing operations which must result in a finish of high quality. Units consist of the following: 2HP. General Electric, totally enclosed, explosion proof, Class 2, Group G, air cooled, ball bearing motor, push button control switch with reset button in cover. The motor is a standard horizontal type, swivel supported on ball-bearings. Special fabricated base of welded construction. Rubber tire ball bearing casters. Special flexible shaft core designed and wound for high production chatterless operation on all types of work. Rubber vulcanized easing complete with flat steel wire inner lining and special couplings to give maximum efficiency.

Call us collect if you require any more information, or if you wish to place an order with us.

Power EQUIPMENT COMPANY

P.O. BOX 534
ROCHESTER 2
NEW YORK
Telephone
HILLSIDE 2041

MACHINE TOOLS

Specials

P & W #2A Jig Borer, New 1945
Cincinnati 375 Ton Press Brake—6½x⅝, New 1942
Clearing 90-10 Press Brake—10' 10 Ga.
Fosdick 24" Sliding Head, Box, Late
56 Ton Thomas OBI Press, New 1947
Gorton Duplicators and Vert. Millers
Gorton No. 3Z, 1D, ME Engravers
B. & S. No. 2 Vert., Swivel Head
Norton, Doall Surface Grinders 8"x24"
Marvel 6A Hacksaw, M.D., Auto. Feed
Injection Moulders, Hydraulic Presses

BORING MILLS

#0 Giddings & Lewis arr. M.D.
2½" Cleveland arr. M.D., 2½", 4" Binsee
Niles-Bement-Pond 4" duplex, Universal 3"
66" Niles; 64" Colburn M.D. 2 hds.
Bullard New Era 24", 42", Vert. M.D.

TURRET LATHES

W. & S. Nos. 3, 4 Grd. Hd., Preselector
Gisholt No. 1L, 2L Univ. M.D.
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36"
Acme #2 M.D.

GRINDERS

No. 34 Abrasive Vert. Surf. #3B, 8x24"
#25 Gallmeyer & Livingston Hyd. Surface
#25A Heald, M.D. like new Rotary Surf.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.B., Vert. Surface 19"x49"
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald No. 72A3 Gagematic
Norton 50"x28', M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D.
No. 55, 60, 65 Heald int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10, 11 Cyl.; 1, 3 Univ.
Norton 6x18" 8x24" Hyd. Surface, M.D.
Covel #91A Tool & Cutter New 1941, Norton

LATHES

Monarch Hendey 12x30, 10x20 G.H. Late
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey, Taper, Collets 16"x8'
9" LeBlond P&W 1"x18" Automatic
36x30' Putnam M.D., 36x22', 42x16
32"x35' Wickes, M.D.
20"x30' Boye & Emmes Grd. Hd.
16x10' South Bend, late, M.D., T.A.
Sundstrand Centering Machine #56

AUTOMATICS

Cleveland Model A ⅜", 1¼", 2"; B 1", 2"
⅞" Cone 4 spindle, Gridley
Brown & Sharpe 0G. New 1941. #2 Hand

New in Stock
Power Shears—52", 72" & 96"

Spot & Arc Welders
5, 7, 14, 18 & 30 ton OBI Power Presses
Ammco 7", Shape Rite 8" Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
No. 1½ Abrasive Surface Grinder
6x6" Racine Hacksaw; #8 Marvel
20 ton Northern Hydraulic Presses

RADIALS

4' Fosdick 13" col., 8' Carlton, 19" col. M.D.
6' Cincinnati-Bickford
4', 5', 6' American Triple Purpose
Canedy-Otto 3'11" Col.

MILLING MACHINES

Cinn. #3 Pl., #4 Vert. Dial Type, Rect.
#3 K. & T. Dbl. overarm, motor in base
Cleveland Vert. No. 1 M.D.; #1 Univ.
#12 Van Norman, Duplex
#2B K & T Univ.; No. 2A B & S Univ.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
B. & S. No. 1, 3, Vert.
B. & S. #12 Elec. Prod. late type, #21

MISCELLANEOUS

Mitts & Merrill, Davis Keyseaters
Wiedman Turret Punch—Type R4P
Buffalo #0 Angle Roll MD.
#20 Bliss OBI, #58-OB Gap Presses
6" Vertical Shaper, P & W
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Pexto 6' Power Shears
Burke & Nichols Millers, Pl. & Univ.
Delta Single & Multiple Drills
Deckel G1, G2 Engraving machines
Landis Dbl. Head Bolt Threader, 2½"

AARON MACHINERY CO., INC.

MONA MEMBER

45 Crosby St.
New York 12, N. Y.

LATE MODELS OF MACHINE TOOLS FOR EARLY DELIVERY

BORING MILLS

42" BULLARD Vert., M.D. Spiral Drive
#360-F GIDDINGS & LEWIS, Floor Type, M.D.
#560-F GIDDINGS & LEWIS, Floor Type, M.D.
#44 UNIVERSAL Tri-Way, Table Type.

GRINDERS

#2 B & S Surface, M.D.
#2 REID Surface, M.D.
#10 B & S Tool & Cutter, M.D.
#72A3 HEALD Plain & Sizematic, M.D.
#4T SELLERS Tool Grinder, M.D.
9" P & W Hyd. Gear Grinder, M.D.
#5 B & S Plain Grinder, M.D.
#11 BLANCHARD Rotary, 16" chuck
6—#4H LANDIS 4"x12" & 4"x18" Plain Grinders, M.D., with hyd. straight infeed, hyd. timer & hyd. footstock.
6"x30" NORTON Type "G" Plain Cyl.
24"x96" NORTON Plain, M.D.

LATHES

AMES Precision Bench Lathe, 1" Collet Cap., M.D.
14"x54" LODGE & SHIPLEY G.H. Lathe, M.D.
12" & 14" x 30' LODGE & SHIPLEY G.H. Lathe, M.D.
14"x30" LeBLOND Hvy. Duty, M.D.
12"x30" MONARCH Mod. "C" Lathe, M.D.
16"x54" LeBLOND Hvy. Duty, M.D.
16"x6' SEBASTIAN Lathe, M.D.
50"x17" centers LeBLOND "BIG SWING" Lathe, M.D.

MILLING MACHINES

#5/60 CINCINNATI, Duplex Hydromatic Milling Machine, tracer control mechanism for automatic rise & fall of spindle carriers, M.D., machine used six months.
#1G & 2G KEMPSMITH All Geared Univ., M.D.
#2L VAN NORMAN Universal Miller, M.D.
#2H K & T Vert., Power Feed, M.D. (3)
#2MS CINCINNATI Dial Type, Plain, M.D.
#4MS CINCINNATI Dial Type, Plain, M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#12-M MOREY 2-spdle PROFILER, M.D.

TURRET LATHES

#0G B & S Auto., M.D.
#0 B & S Wire Feed Screw Machine, M.D.
#2G Morey Ram Type, M.D.
Nos. 3, 4, & 5 W&S Ram Type Univ., M.D.
Nos. 3, & 5 J & L Ram Type Univ., M.D.
#1A W & S Saddle Type Univ., M.D.
#2A W & S Saddle Type Univ., M.D.
#4A W & S Saddle Type Univ., M.D.

MISCELLANEOUS

6'x48" THOMPSON Broach Grinder.
#36-H GOULD & EBERHARDT Gear Hobber.
1½" Dble. Head LANDIS Thdg. Mach., M.D.
Used Bases for 4' & 6' CINCINNATI BICKFORD Radials
#4—48" B & S Gear Cutter
40"x32"x51" OHIO Tilting & Revolving Rotary Table for Horizontal Boring Mill.
14" STEPTOE Shaper, V-belt, M.D.
V-16 DOALL Contour Saw, M.D.

WIGGLESWORTH MACHINERY CO.
203 BENT STREET — CAMBRIDGE, MASS.

EXPERIENCE
is the best teacher

especially in
MACHINERY APPRAISALS

- ACTUAL EXPERIENCE gives you accurate figures—not theory or guesswork—on cash value . . . going concern value . . . replacement value.
- Our appraisals draw upon the experience of specialists—men who have sold millions of dollars worth of machinery, inventories and plants . . . experts who have testified in hundreds of valuation proceedings.

RECENT APPRAISALS

- New Process Gear Corporation, Syracuse, New York
- Edison-Splitdorf Corporation, New Jersey & Pennsylvania
- Messinger Bearings, Inc., Philadelphia, Pennsylvania
- Titeflex, Inc., Newark, New Jersey

Consult: Paul Kifner, Vice Pres. Machinery and Plant Department

ACTION! IN INDUSTRY
Asset Realization co.
14 Church Street, New York 6, N. Y.
790 Broad Street, Newark 2, New Jersey

HASCO'S MACHINE TOOL BARGAINS

MACHINES JUST ARRIVED IN STOCK

PUTNAM 42"x18' Geared Head Lathe
GOULD & EBERHARDT 24 M/D Shaper
CINCINNATI 12"x36" Universal Grinder
BROWN & SHARPE #1 Universal Grinder
PRATT & WHITNEY 12"x6' Geared Head Lathe
VAN NORMAN #22L Miller
BULLARD 36" Vertical Turret Lathe M/D
NEW ROCKFORD PRESSES O.B.I. 25-100 ton

Prompt Delivery

WRITE FOR HASCO'S #1147A
Latest machine circular

HASCO MACHINERY COMPANY
661 FRELINGHUYSEN AVENUE
NEWARK 5, NEW JERSEY
Bigelow 3-3486-7-8

FOR SALE — BORING MILL

Used 7 to 10 ft. Betts Vertical Boring Mill, Belt drive, two swivel heads, swing 126", maximum height under tool holder 58". *Now in service. Inspection invited. Write*

CLEARFIELD MACHINE COMPANY
Clearfield, Pa.

MODERN MACHINES

(Motors 3/60/220 & 440.)

Blowers, No. Am. 1, 2 & 10 H.P. 3/60.
Boring Mill 42" Bullard, "New Era".
Grinder, Univ. #1 B & S (New).
Grinder, #13 B. & S., steel cabinet. (1945)
Grinder, G. & L. Surface, 14"x72", Mag. Ck.
Lathe, 608 Rivett BB., 1⅛" HS; TA; QCG.
Lathe, 9x24" Hardinge, compound & collets.
Lathe, 20'x12' Cin. GH, M.D. (New).
Miller, #36 Van Norman, index Head, subhead, rotary table and pump.
Riveter, Hanna, 36x24", cyl. 15", truss frame.
Shaper 24" Gould & Eberhardt, gear box, M.D.

GALBREATH MACHINERY CO.
Empire Building — Pittsburgh, Pa.

ENGINEERED REBUILT MACHINE TOOLS

BUILT MACHINE TOOLS

ENGINEERED REBUILT

FOR THE HEAVY TOOLS . . . SEE SIMMONS

LATHES

30" x 12' Boye Emmes G H
30" x 18' American G H
36" x 28' Lodge & Shipley
60" x 15' centers Niles G H
100" x 32' Niles Extra Heavy

RADIAL DRILLS

3½' Cincinnati Bickford
4' Carlton, motor on arm
7' Carlton, motor on arm
8' American, motor on arm

MILLERS

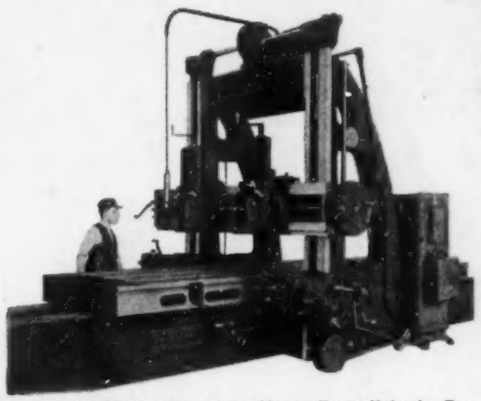
No. 5 Cincinnati Plain
No. 3-B Milwaukee Plain
1-B Milwaukee Universal

BORING MILLS

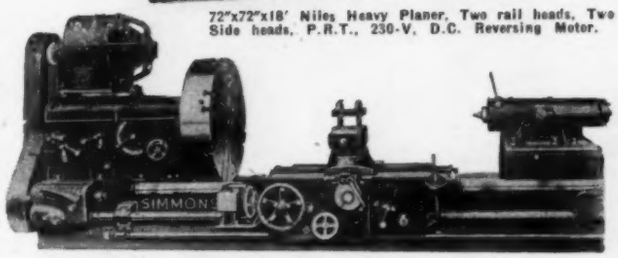
24" Bullard, New Era
62" Niles 1-swivel, 1-turret
84" Cincinnati 2-swivel heads
12' Betts 2 swivel heads
12' N.B.P. 2 swivel heads
16-24' Niles extension type
3" spindle Universal Tri-Way
No. 33 Lucas table type
4½" spindle No. 33 Lucas

GEAR HOBBERS

150" Muir, 102" Table
100" G & E, 84" Table
84-H Gould & Eberhardt
Biernatzki, 30" capacity
48" x 10" B & S Spur Cutter



72"x72"x18' Niles Heavy Planer, Two rail heads, Two Side heads, P.R.T., 230-V, D.C. Reversing Motor.



48"x40' Simmons Heavy Screw Cutting Engine Lathe, Geared Head for A.C. or D.C. Motor Drive.

Write today for Complete Current Stock List of Simmons *Engineered-Rebuilt* Machine Tools

SIMMONS MACHINE TOOL CORPORATION
MAIN OFFICE AND PLANT 1759 N. BROADWAY ALBANY 1, N. Y. NEW YORK OFFICE 50 EAST 42ND STREET
ENGINEERED Machine Tool REBUILDING

FOR SALE
PRACTICALLY NEW MACHINES

(1) Landis Type C Crankshaft Grinder 18"x66", Complete with all Equipment. Price $8750.00
(1) 2¼" Capacity Six Spindle Con-O-Matic. Complete with Threading Equipment and Large Amount of Collets, Pushers, Etc. Price $7000.00
(1) #2-H Kearney & Trecker Plain Horizontal Milling Machine. Less Than Six Months Service. Complete. Price $3500.00
(2) #2—24 Cincinnati Plain Hydromatic Milling Machines. Price....$1850.00 ea.
(1) #4—36 Cincinnati Plain Hydromatic Milling Machine. Price $3500.00

Inspection at Our Warehouse

WINSTON MACHINERY CO., INC.
517 South Delaware Street
INDIANAPOLIS 4, INDIANA

STOCK TOOLS — *Prompt Shipment*

AIR COMPS., 50, 130, 220 & 350 c.f., 100#
AUTOMATICS 3½" Cone 4-Spindle (4)
BOLT CUTTERS, dbl. head, 1", 1½" & 2"
BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" bar Universal
BORING MILL, Hor. 3½" Landis Floor Type.
BORING MILL, 36" Bullard, "New Era"
BORING MILL, 36" King, 2 heads, M.D.
DRILL, Radial 6' Carlton, M.D.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr. Hyd.
GRINDER, Plain 14"x72" Norton
GRINDERS, Surf. Nos. 3 & 5 Abrasive
GRINDER, Surf. Hyd. G & L 14"x18"x72"—1942
GRINDER, Surface, No. 25 Heald Rotary
HAMMER, Pneu., No. 6B Nazel, M.D.
LATHE, 20"x12' L & S, 12 Speed, Grd. Hd.
LATHE, 24"x16' B & E Grd. Hd.—1940
LATHE, 27"x18' Niles "Timesaver," Grd. Hd.
LATHE, 38"x19' Putnam, Grd. Hd. Q.C.G., T.A.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
MILLER, Thread, No. 40 Lees-Bradner
MULT-AU-MATICS, Bullard Type A, 6 Spdle.
PLANER, Openside, 36"x36"x12' Cleveland
SHAPER, 24" Stockbridge, M.D.
SHEAR, Plate, 84"x¼" Canton, M.D.

PARTIAL LIST

LANG MACHINERY COMPANY
28th St. & A.V.R.R. Pittsburgh, Pa.

RECORD-BREAKING SALES MACHINERY INVENTORY

Entire Plants or Surplus

- November, 1945, Buffalo, over 5,000 attendance, over $800,000 cash realized!
- June, 1946, Paterson, 5-day sale, over $1,300,000 realized!
- June, 1947, auctioned factories for $3,200,000!
- October, 1922-April, 1923, Durant Motors, sold over 200 carloads machinery in 6 months' private sale!
- First Time — Saturday Auction — 11/22 for Bendix Aviation Corp., attracted over 400 buyers.

We have 29 years' experience in selling industrial property, equipment, inventories, through private or auction sale.

Consult: Paul Kifner, Vice Pres. Machinery and Plant Division

ACTION! IN INDUSTRY
Asset Realization Co.
14 Church Street, New York 6, N. Y.
790 Broad Street, Newark 2, New Jersey

SHEET METAL MACHINERY

NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

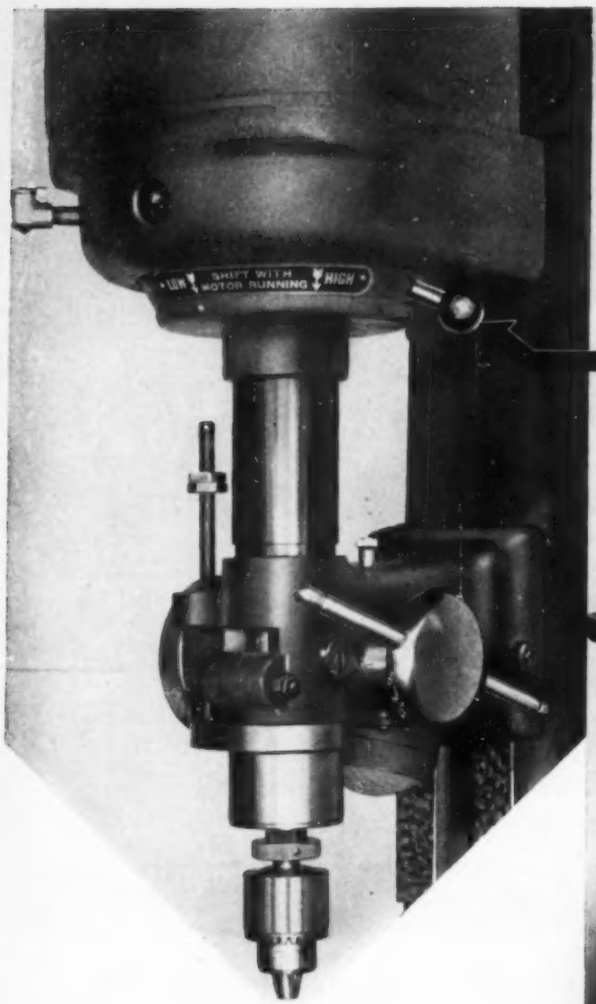
MDNA
B. D. BROOKS, INC.
361 Atlantic Ave., Boston, Mass.

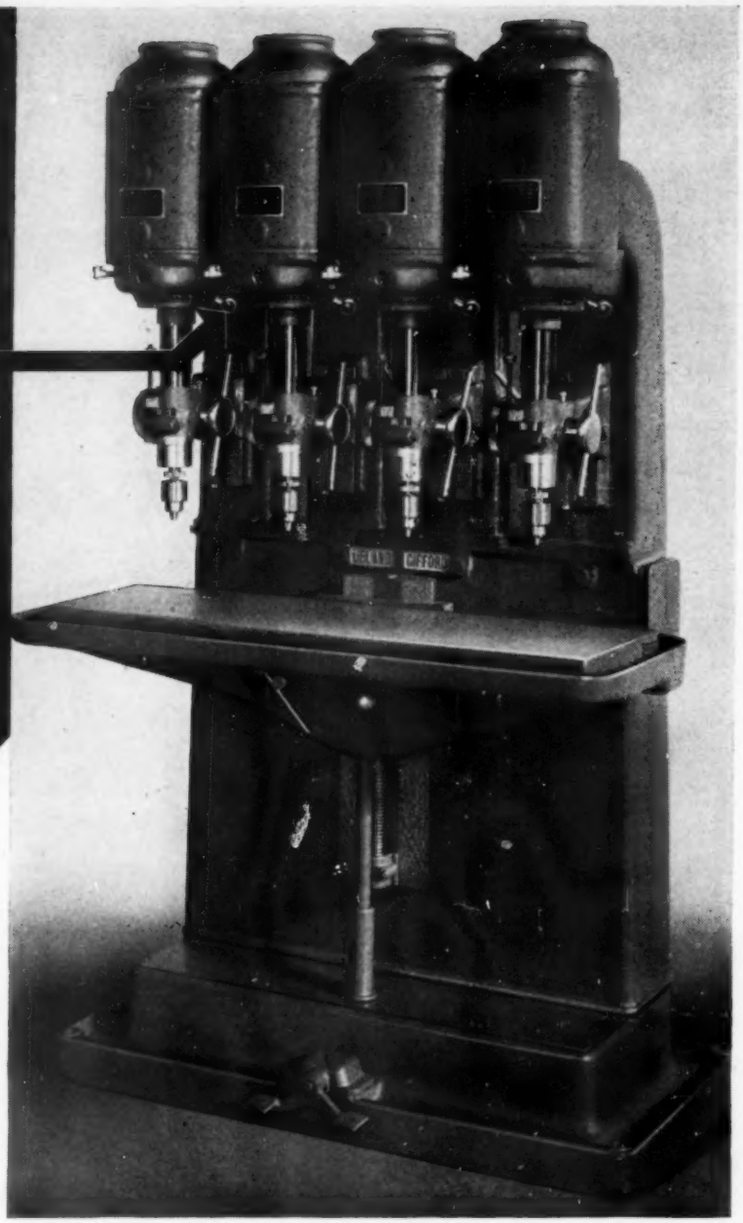
¾" x 10' Plate Shear—$8250.00
½" x 10' Power Press Brake — $4950.00
With electrical equipment, immediate delivery.
PAUL'S MACHINERY CO.
6111 VERMONT AVE., DETROIT 8, MICH.
Tyler 7-6300

LATE TYPE TOOLS

36" Bullard Spiral Drive, 1943 tool
No. 2MH Cincl. Univ. Miller, 1944
No. 2H K. & T. Univ. Miller, 1944, slotting & vert. attach. & rotary table.
Nos. 2, 3, 4, & 5 W. & S. Univ. Turrets, late
22"x96" centers Monarch, new 1944
36"x23' centers, 42"x17' centers, 48"x16' centers, & 60"x15' centers Niles Lathes, all new 1942
28/50"x14' Rahn-Larmon Gap Lathe, T. A.
No. 48H Gould & Eberhardt Gear Hobbers, 1941
12" Gleason Gear Generators, 1943 (3)
6' Fosdick Radial, 19" col., 1943.

BENNETT MACHINERY CO.
30 Church St. N. Y. 7, N. Y.





SPINDLE SPEEDS

of 600/900/1200/1800 or 600/1200/1800/3600 RPM are obtainable directly from the Totally Enclosed, Fan Cooled, Ball Bearing Motors on . . .

LELAND-GIFFORD No. 1 LMS DRILLING MACHINES.

When higher speeds are needed, a slight movement of the Shifter Lever which engages the ROLLER FRICTION SPEEDER used with the 1800 top speed motor gives FOUR ADDITIONAL SPEEDS of 3000/4500/6000/9000 RPM.

NO GEARS OR BELTS and the speeder can be ENGAGED or DISENGAGED *without stopping the motor.*

LELAND-GIFFORD

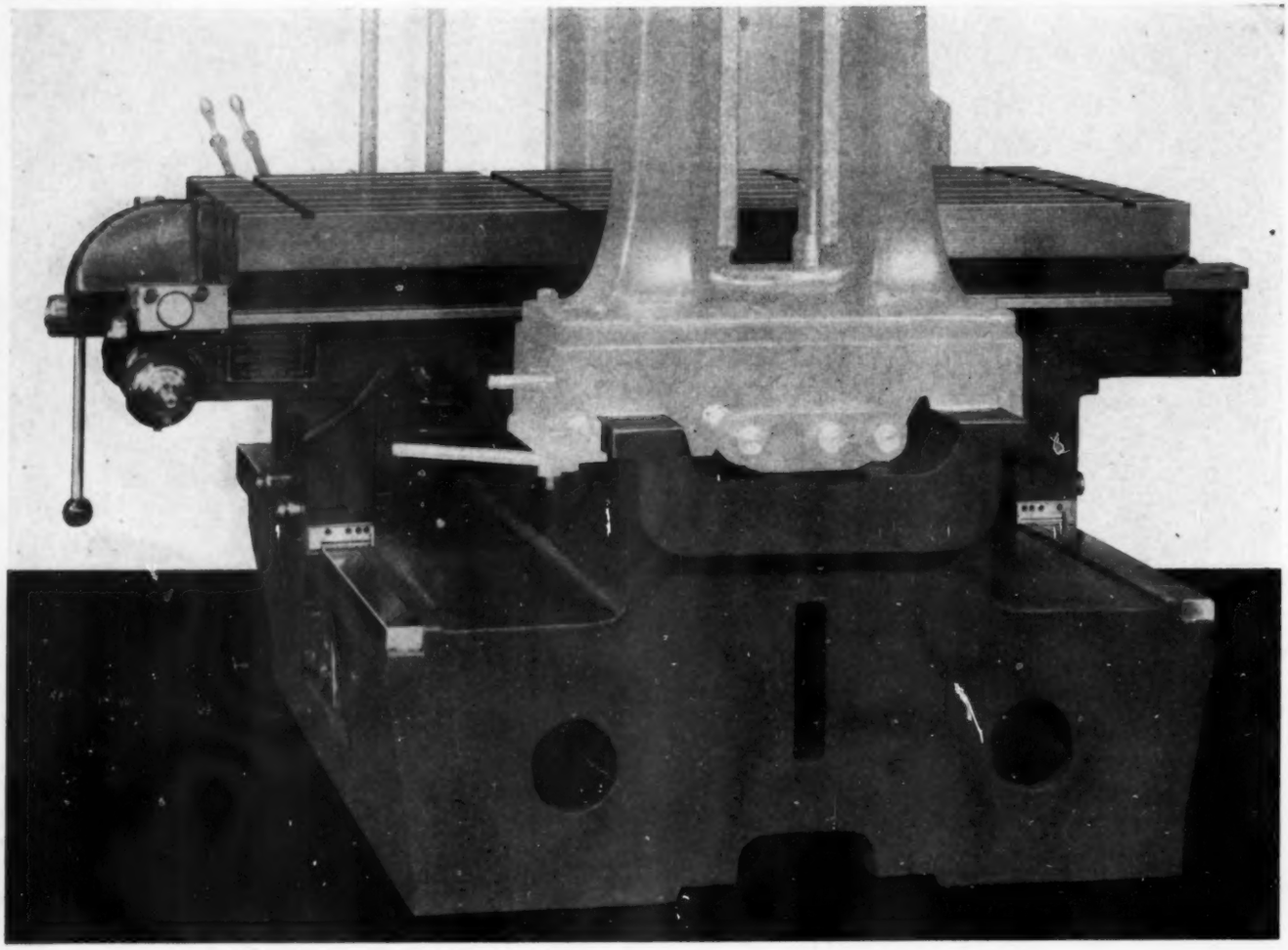
WORCESTER 1, MASSACHUSETTS, U. S. A.

INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives 40-41, 209
Accessories & Attachments (Machine Tool) 76, 212, 232, 238
Arbors & Mandrels.....212
Balers, Scrap Metal.....211
Bearings.....4th Cover, 159, 169, 193, 205, 222, 249
Books, Technical 248
Boring, Drilling & Milling Machines (Horizontal) .....2nd Cover, 8-9, 10-11, 154, 165, 206, 213, 272
Boring & Turning Machines (Vertical) 34-35, 43, 71, 196, 206
Broaching Machines 150
Brushes 229
Centering Machines.....31
Chucks.....210, 216, 232, 236
Coolant Systems, Filters & Supplies....234
Cut-Off Machines; Sawing Machines..189, 202, 234
Dressers, Grinding Wheel.....206, 218
Drilling & Tapping Machines....31, 71, 74, 78, 224, 233, 240, 242, 246, 270
Dust Collectors 36-37
Engineering & Production Services.69, 191, 255-269
Fasteners 214, 231, 247
Finishing Machines 210
Gages & Instruments..17, 55, 179, 200, 210, 230, 232, 240, 250
Gear Cutting Machines.....6-7, 157, 232
Gears, Speed Reducers, Motor Reducers.62, 80, 184, 194, 221, 223, 224, 225, 226, 248
Grinders—Cutter & Tool...3, 173, 219, 246
Grinding Machines—Production....5, 8-9, 14-15, 18-19, 34-35, 62, 70, 202, 236, 243
Heads: Drilling, Grinding & Tapping..213, 214, 236, 238
Heat Treating Equipment & Supplies..79, 200
Honing Machines.....71, 190
Jig Borers.....52, 242
Lathes, Automatic.....27, 28-29, 50, 57
Lathes, Engine....16, 27, 28-29, 30, 42, 57, 68, 76, 171, 206, 237, 274
Lathes, Turret.....50, 57, 63
Lubricants, Cutting Fluids, Quenching Oils, Rust Preventives.....61, 84, 192, 197, 210, 220
Lubricating Systems & Equipment..36-37, 81, 234, 236
Materials, Cutting & Forming.....26, 60, 161, 204
Materials of Manufacture...51, 59, 77, 152, 163, 169, 198-199, 203, 227-228, 241, 242
Materials Handling Equipment....180, 230
Millers, Die Sinkers, Profilers....4, 34-35, 71, 242, 245
Parts & Equipment, Electrical....33, 24-25, 44-45, 49, 65, 189, 195
Parts & Equipment, Hydraulic & Pneumatic 20
Parts & Equipment, Mechanical.....244
Planers.....56, 64
Power Transmission 46
Presses, Forging & Forming Equipment & Supplies.....32, 73, 82, 177, 178, 201, 202, 207, 212, 214, 217, 226, 234, 239, 240, 246, 276
Riveting Machines.....214
Safety Equipment 182
Screw Machines; Chucking Machines.....3rd Cover, 38-39
Shapers, Slotters, Keyseaters...71, 86, 202, 212
Shop Furniture 72
Special Machine Tools.....71, 206, 238
Spindles, Machine 75
Swaging Machines 200
Textiles 175
Threading Machines 12-13, 34-35, 47, 200, 254
Tooling Set-Up Equipment.....48, 212
Tools, Cutting....21, 22-23, 53, 58, 60, 67, 147, 148, 167, 181, 183, 185, 187, 188, 208, 214, 215, 232, 234, 246, 251
Tools, Portable.....54, 67, 218, 235, 244
Transportation 230
Welding & Cutting, Brazing & Soldering Equipment & Supplies.....182, 186, 253

4 ways
IN A ONE-PIECE BED CASTING

GIVE **LUCAS HORIZONTALS**
Extra Stability – Superior Rigidity!



It's the two, extra outer ways, supported by a one-piece bed casting, that gives the LUCAS table greater carrying capacity . . . And it has been proven that this type of support reduces to a minimum the inherent deflection of the table at extreme positions. A rigid section of the bed supports the outer ways at a position substantially above the floor level. This is just one of the many points of LUCAS superiority – send for catalogue.

LUCAS
MACHINE TOOL COMPANY
12302 KIRBY AVENUE
CLEVELAND 8, OHIO

MANUFACTURING EXCLUSIVELY 3, 4 and 5 INCH SINGLE SPINDLE HORIZONTAL BORING, DRILLING AND MILLING MACHINES

ADVERTISERS INDEX

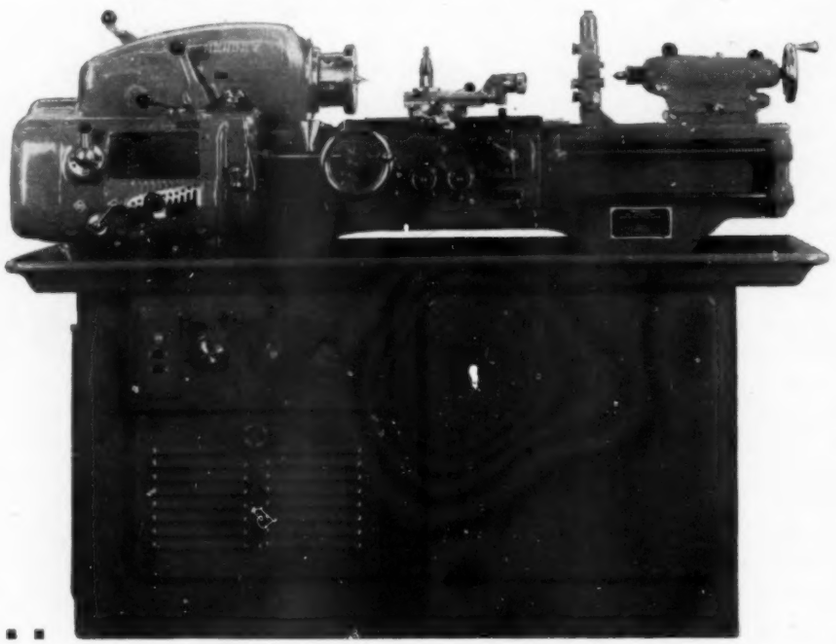
	Page
Abrasive Machine Tool Co.	173
Acme Machine Tool Co.	63, 157
Adams Company	66
Air Reduction	253
Allegheny Ludlum Steel Corp.	59
Allis-Chalmers Manufacturing Co.	20, 46, 65
Almond Mfg. Co., T. R.,	236
Aluminum Co. of America	77
American Brass Co.	227, 228
American Magnesium Corp.	51
American Rolling Mill Co.	152
American Screw Co.	231
American Tool Works Co.	16
Ames Co., B. C.	179
Amgears Inc.	184
Anton Machine Works	232
Apex Machine & Tool Co.	235
Armstrong-Blum Mfg. Co.	58
Armstrong Bros. Tool Co.	54
Auto Engine Works Inc.	226
Automotive Gear Works Inc.	221
Avey Drilling Machine Co.	224
Axelson Manufacturing Co.	237
Baker Bros., Inc.	236
Baldwin Southwark Div., Baldwin Locomotive Works	239
Barber-Colman Co.	53
Bath & Co., John	208
Baumbach Mfg. Co., E. A.	212
Bethlehem Steel Co.	26
Blanchard Machine Co.	70
Brad Foote Gear Works	226
Bridgeport Machines Inc.	245
Brown & Sharpe Mfg. Co.	34, 35
Bryant Chucking Grinder Co.	62
Buffalo Bolt Co.	247
Bullard Co.	27, 28, 29
Bunting Brass & Bronze Co.	169
Butterfield Div., Union Twist Drill Co.	22
Carboloy Co., Inc.	218
Card Mfg. Co., S. W.	23
Carlton Machine Tool Co.	224
Central Screw Co.	231
Chambersburg Engineering Co.	276
Cimcool Division, Cincinnati Milling Machine Co.	61
Cincinnati Bickford Tool Company	78
Cincinnati Gear Co.	225
Cincinnati Gilbert Mach. Tool Co.	246
Cincinnati Grinders Incorporated	8, 9
Cincinnati Milling Mach. Co.	4, 5
Cincinnati Planer Co.	56
Cincinnati Shaper Co.	86
Clark Controller Co.	195
Clark Tructractor Div., Clark Equipment Co.	180
Clearing Machine Corp.	217
Cleveland Automatic Mach. Co.	3rd Cover
Cleveland Crane & Eng. Co.	177
Cleveland Punch & Shear Works Co.	32
Cleveland Twist Drill Co., Momax Div.	60
Columbus Die Tool and Mach. Co.	240
Commander Mfg. Co.	236
Cone Automatic Machine Co.	75
Consolidated Mach. Tool Corp.	183
Continental Screw Co.	231
Corbin Screw Div. of American Hdw. Co.	231
Cosa Corporation	219
Coulter Machine Co., James	200
Cross Co.	71
Cullen-Friestedt Co.	186
Curtis Universal Joint Co.	244
Cushman Chuck Co., Inc.	216
Danly Machine Specialties	82, 226
Davis & Thompson Co.	206
Davis Keyseater Co.	212
Dayton Rogers Mfg. Co.	246
Defiance Machine Works, Inc.	213
DeLaval Separator Co.	81
Dempster Brothers Inc.	211
Detroit Tap & Tool Co.	167
DeVlieg Machine Co.	52
Dodge Mfg. Corp.	222
Eastern Machine Screw Corp.	214
Elco Tool & Screw Corp.	231
Erie Foundry Co.	201
Errington Mechanical Laboratory	238
Fafnir Bearing Co.	205
Farnham Machinery Co.	238
Fellows Gear Shaper Co.	6, 7
Firth-Sterling Steel Carbide Corp.	204
Foote-Burt Co.	150
Force & Company, Wm. A.	230
Ford Motor Co., Johansson Div.	230
Fosdick Machine Tool Co.	74
Gallmeyer & Livingston Co.	202
Ganschow Gear Co.	224
Gardner Machine Co.	243
Gear Specialties Mfrs.	80
General Electric Co., Apparatus Dept.	17, 24, 25, 44, 45, 79
Geometric Tool Co.	188
Gisholt Machine Co.	57
Gleason Works	3
Gorham Tool Co.	251
Goss & de Leeuw Machine Co.	210
Grant Gear Works	225
Grant Mfg. & Machine Co.	214
Gray Co., G. A.	64
Greenfield Tap & Die Corp.	187
Grobet File Co. of America Inc.	246
Gulf Oil Corp.	197
Hamilton Tool Co.	240
Hanson Whitney Machine Co.	254
Hardinge Brothers, Inc.	30
Harper Co., H. M.	231
Hartford Special Machinery Co.	212, 226
Haskins Co., R. G.	218
Haynes Stellite Company	241
Heald Machine Co.	2nd Cover
Hendey Machine Co.	274
Hills Mfg. Co.	244
Hones, Inc., Charles A.	200
Hyatt Bearings Div., General Motors Corp.	249
Industrial Plants Corp.	191
International Screw Co.	231
J & S Tool Co.	206
James Gear Mfg. Co., D. O.	224
Jones & Lamson Machine Co.	47
Jones & Laughlin Steel Corp.	163
Kennametals Inc.	185
King Machine Tool Co.	43
Knight Machinery Co., W. B.	196
L-W Chuck Co.	252
Lamson & Sessions Co.	231
Landis Machine Co.	12, 13
Landis Tool Co.	14, 15
Leland-Gifford Co.	270
Lempco Products Inc.	234
Linley Brothers Co.	242
Littell Machine Co., F. J.	236
Lodge & Shipley Co.	63, 157
Lucas Machine Tool Co., Inc.	272
Luers, J. Milton	232

THE NEW HENDEY 9"x24"

TOOL AND GAGE MAKER'S LATHE

GIVES YOU THESE LONG-WANTED FEATURES

1. *Greater Capacity* — 1⅛" maximum capacity of Spring Collets.
2. *Finer Control* — 66 different feeds, 66 different threads without gear change.
3. *Higher Speed* — Up to 2000 r.p.m. forward and reverse.
4. *Greater Sensitivity* — Stepless speed over entire range provided by DC power unit.



AND MORE . . .

To insure precise production the new Hendey 9"x24" has these additional features. Hardened and ground spindle runs in super precision, preloaded, anti-friction bearings. The lead screw is held to .0005" per foot of lead and is used only for thread cutting. A separate feed rod, independent of the lead screw, is provided. Lubrication is automatic throughout.

The new Hendey 9"x24" is the precision lathe that fulfills a long standing desire of tool and gage makers everywhere. Full information on this highly accurate, sensitive and versatile lathe, is contained in the new 9" x 24" catalog—send for it today.

The Hendey Machine Company

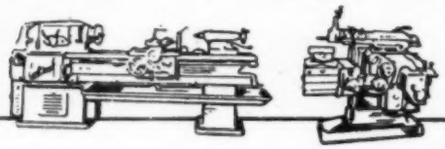
Hendey

Main Office and Plant — Torrington, Connecticut

Offices — N. Y., Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

Representatives in — Philadelphia, Cleveland, Pittsburgh

TOOL ROOM LATHES
12" - 14" - 16" - 18" - 20"



SHAPERS
12" - 16" - 20"

ADVERTISERS INDEX

	Page
McGraw-Hill Book Co., Inc.	248
Mead Specialties Co.	238
Meisel Press Mfg. Co.	248
Micromatic Hone Corp.	190
Milford Rivet & Machine Co.	231
Modern Tool Works Div. of Consolidated Machine Tool Corp.	183
Moline Tool Co.	242
Monarch Machine Tool Co.	171
Moore Special Tool Co.	233
Motch & Merryweather Co.	215
National Acme Co.	38, 39
National Automatic Tool Co., Inc.	165
National Lock Co.	231
National Machine Tool Co.	202
National Screw & Mfg. Co.	231
Newark Gear Cutting Machine Co.	224
New Britain-Gridley Machine Div., New Britain Machine Co.	154
New Departure Div., General Motors Corp.	159
New England Screw Co.	231
Nicholson File Co.	181
Nicholson & Co., W. H.	212
Norton Company	18, 19, 40, 41
Oliver Instrument Co.	246
Orange Roller Bearing Co., Inc.	193
Osborn Manufacturing Company	229
Owens-Corning Fiberglas Corp.	198, 199
Parker Kalon Corp.	231
Parker Rust Proof Company	220
Pawtucket Screw Co.	231
Perkins Machine & Gear Co.	194
Pheoll Mfg. Co.	231
Philadelphia Gear Works, Inc.	223
Phillips Screw Manufacturers	231
Potter-Johnston Machine Co.	50
Pratt & Whitney Div., Niles-Bement-Pond Co.	67
Precision Gear Co.	224
Production Machine Co.	210
Railway Express Agency Air Exp. Div.	230
Reading Screw Co.	231
Reeves Brothers Inc.	175
Republic Gage Co.	240
Reynolds Metals Co. Inc., Aluminum Div.	203
Rivett Lathe & Grinder Inc.	48
Rodgers Hydraulic, Inc.	178
Russell Burdsall & Ward Bolt & Nut Co.	231
Ruthman Machinery Co.	234
Sales Service Machine Tool Co.	202
Scherr Co., Inc., George	250
Scovill Mfg. Co.	231
Seneca Falls Machine Co.	31
Shakeproof Inc.	231
Sheldon Machine Co., Inc.	206
Shore Instrument & Mfg. Co., Inc.	200
Sidney Machine Tool Co.	42
Sier-Bath Gear & Pump Co., Inc.	225
South Bend Lathe Works	68
Southington Hdw. Mfg. Co.	231
Springfield Machine Tool Co.	76
Square D Co.	33
Standard Machinery Co.	212
Standard Pressed Steel Co.	72, 214
Star Electric Motor Co.	189
Starrett Co., L. S.	148
Steel Co. of Canada Ltd.	231
Steelweld Machry. Div., Cleveland Crane & Engineering Co.	177
Sterling Bolt Co.	231
Sterling Electric Motors Inc.	49
Sterling Grinding Wheel Div.	209
Stronghold Screw Prod. Inc.	231
Stuart Oil Co., Ltd., D. A.	192
Tannewitz Works	234
Texas Co.	84
Thomas Hoist Co.	232
Threadwell Tap & Die Co.	147
Timken Roller Bearing Co.	4th Cover
Torrington Co.	200
Tungsten Electric Co.	161
Union Carbide & Carbon Corp.	241
Union Twist Drill Co.	21
U. S. Drill Head Co.	214
U. S. Steel Corp.	242
U. S. Steel Supply Co.	242
V. & O. Press Co.	214
Van Keuren Co.	55
Van Norman Co.	10, 11
Verson Allsteel Press Co.	207
Vulcan Tool Corp.	69
Waltham Machine Works	232
Westinghouse Electric Corp. Sturtevant Div.	36, 37
White & Bagley Co.	210
Willson Products Inc.	182
Wilson, K. R.	73
Wilson Mechanical Instrument Co.	210
Wolverine Bolt Co.	231

■

PROFESSIONAL SERVICES 255

■

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT
- Positions Vacant 255
- Selling Opportunities Offered 255
- Positions Wanted 256

SPECIAL SERVICES
- Contract Work 255
- Alma Motor Co. 255
- Dayton Rogers 255
- General Grinding Co. 255
- General Pattern Works 255
- Hopper Machine Co., C. H. 255
- Metomic Corp. 255
- National Gas Equipment Co., Inc. 255
- Universal Thread Grinding Co. 255
- Waltham Screw Co. 255

EQUIPMENT
(Used or Surplus New)
- For Sale 256-269

WANTED
- Equipment 256

ADVERTISERS INDEX

Aaron Machinery Co. 258, 260, 266, 268
Assets Realization Co. 268, 269
Austin-Hastings Co., Inc. 256
Bennett Machinery Co. 269
Bliss Co., E. W. 256
Botwinik Bros. of Mass. Inc. 264
Brooks Inc., B. D. 269
Brownell, Hazard 264
Bryne & Rice Supply Co. 266
Clearfield Machine Co. 268
Continental Salvage & Machinery Corp. 256
Cox Machinery Co. 262
DeWitt Tool Co. 256
Donberg & Danits 265
Dony Machinery Co. 262
Dresser Manufacturing Div. 256
Eastern Machinery Co. 261
Emerman Machinery Corp. 260
Falk Machinery Co. 257
Galbreath Machinery Co. 268
Hasco Machinery Co. 262, 268
Hill-Clarke Machinery Co. 258
Hyman & Son, Joseph 266
Indianapolis Machinery & Supply Co. 266
Katolight 256
Kings County Machinery Exchange 263
Lang Machinery Co. 269
McDonald Machinery Co. 262
Michigan Steel Tube Products Co. 256
Miles Machinery Co. 264
Monarch Machine Tool Co. 255
Morey Machinery Co. 259
Naktil Corp. 256
National Machinery Exchange Inc. 264
Nylen Products Co. 256
Oldach Co., Inc., E. M. 256
Osborne & Sexton Machinery Co. 260
Paul's Machinery Co. 260, 269
Power Equipment Co. 267
Revere Copper & Brass Inc. 256
Reynolds Machinery Co. 258
S & S Machinery Co. 262
Schill Corp., Franklin Edward 266
Simmons Machine Tool Co. 269
Special Engineering Service Inc. 255
United Machinery & Tool Corp. 262
Utility Industries Co. 266
Victor Machinery Exchange 260
Westbrook Elevator Mfg. Co. 256
West Penn Machinery Co. 266
Whaley Engineering Corp. 256
Wigglesworth Machinery Co. 268
Winston Machinery Co., Inc. 269

The New Chambersburg CEC-O-DROP will out-produce any existing gravity drop hammer

CHAMBERSBURG
Builders of IMPACT Machinery

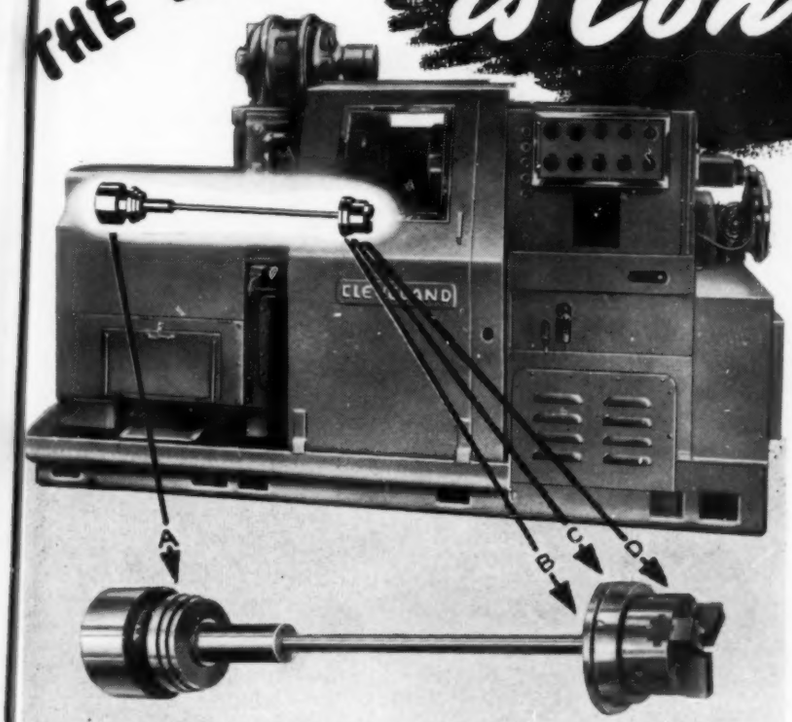
1897 ★ Fiftieth Anniversary ★ 1947

CHAMBERSBURG ENGINEERING COMPANY • CHAMBERSBURG, PENNA.

THE NEW DIALMATIC CLEVELAND *is Convertible!*

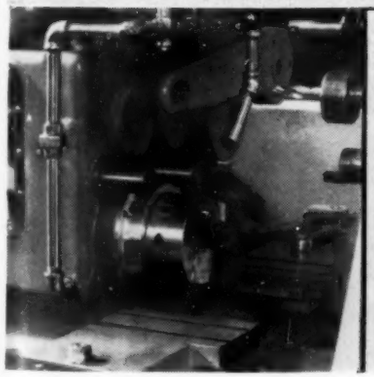
...achine

in 30 minutes!



★ On the Model AB Cleveland, the complete assembly for feeding bar stock can be quickly removed from the spindle by releasing a latch. To convert to a chucker, simply remove the stock feed group, independent cut-off and collet, and substitute the chucking attachment. Chucking attachment consists of air cylinder with pull rod (A), oil seal (B), chuck adapter (C), three-jaw air chuck (D).

Chuck can be controlled either automatically or with hand operated air valve. If hand loading is required, the spindle motor can be equipped with a stopping device. If the shape of the work permits automatic loading, a chute-type magazine can be provided.



★ Showing chucking attachment installed and independent cut-off removed. As a chucking automatic, both front and rear cross slides and all five turret positions are available for tooling.

Here is *double-duty versatility* that gets at the heart of cost-cutting. Never before has one automatic been so adaptable to such a wide variety of work.

In addition to being convertible—*either as a bar or a chucking automatic*—the new Model AB Dialmatic Cleveland incorporates other advanced improvements that further its ability to cut costs.

Electric feed drive for turret tools makes set-up time profitably short. Separate, infinitely adjustable forward and return feeds are pre-set on the control panel for each turret position. As the feed rate for any tool can be varied as it is cutting, the job can be *tuned* to maximum production without time-wasting, set-and-try mechanical adjustments.

Spindle speeds range from 24 to 1820 r.p.m.—plenty of speed and power for machining non-ferrous metals and to make full use of carbide tooling.

These and many more features combine to make the Model AB Dialmatic Cleveland the last word in automatic screw machine design. Let Cleveland engineers show you how this versatile automatic can be applied to your production. Send us details of your work.

WRITE for your free copy of the new bulletin fully describing the Model AB Dialmatic.

Remember,

Cleveland's Cut Costs

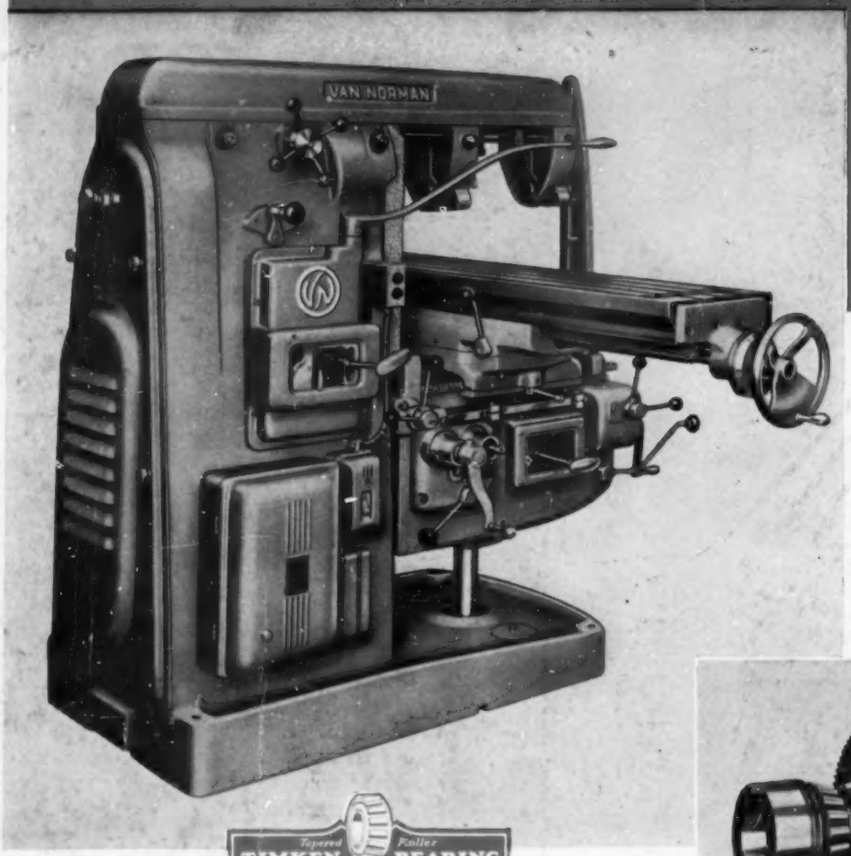
THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 BEECH STREET • • CINCINNATI 12, OHIO

CHICAGO (6) 3710 Civic Opera Bldg. CLEVELAND (14) 1114 NBC Bldg. DETROIT (2) 540 New Center Bldg.

HARTFORD (1) 529 Capital National Bank Bldg. NEW YORK (6) 2402 Singer Bldg.

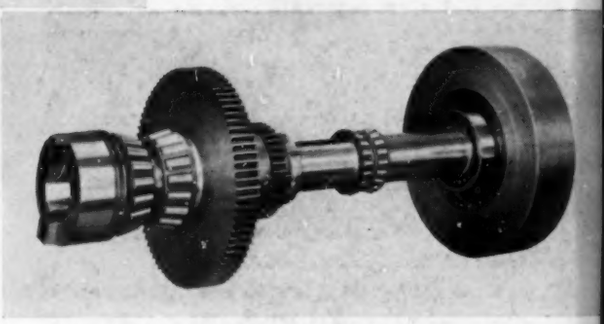
MILLING PRECISION BY VAN NORMAN



Tapered Roller TIMKEN BEARING EQUIPPED

Van Norman No. 2 Heavy Milling Machine with Timken Bearings on the spindle and spindle drive transmission.

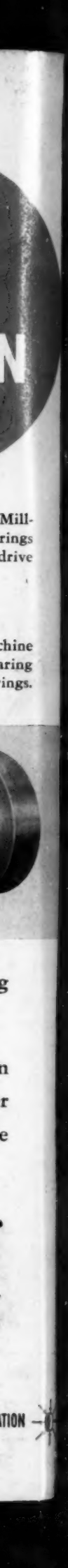
Van Norman No. 2 Milling Machine spindle showing multiple bearing mounting with 4 Timken Bearings.



The Van Norman Company's long-standing reputation for precision machining equipment is emphasized in their No. 2 Heavy Milling Machine pictured here.

With sound modern design, high quality materials and accurate manufacture Timken Tapered Roller Bearings team up to assure the utmost in precision. Like so many other well-known machine tool builders, Van Norman realizes that precision pays off at the spindle nose and that Timken Bearings assure rigid spindles free from chatter at any speed, feed and cutting load. Make sure you have them on your machine spindles. Look for the trade-mark "TIMKEN" on every bearing you use.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

THE TIMKEN ROLLER BEARING COMPANY, CANTON 6, OHIO

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↕ AND THRUST →▯← LOADS OR ANY COMBINATION →✳←